JPRS-ULS-93-014
8 December 1993

FOREIGN BROADCAST INFORMATION SERVICE

JPRS Report

Science & Technology

Central Eurasia: Life Sciences

Science & Technology
Central Eurasia: Life Sciences

JPRS-ULS-93-014 8 December 1993

CONTENTS

NOTICE TO SUBSCRIBERS:

In the interest of efficiency and to contain costs, this report will become part of a larger compilation entitled CENTRAL EURASIA: SCIENCE AND TECHNOLOGY in January 1994. You will continue to receive material, both translations and abstracts, on scientific and technical developments in CIS. Because of processing efficiencies with the new format, you should receive material faster. You will also be able to scan and review material in related technical areas. After the consolidation we will survey customers about coverage and timeliness. If you are no longer interested in receiving this report, please inform us using the contact address provided on the back cover of this report.

Environment

Genetics

Immunology

Medicine

Microbiology

Nonionizing Radiation Effects

Physiology

Public Health

Psychology

Radiation Biology

Fantasy? No—Reality

937C0352a Moscow DOSTIZHENIYA NAUKI I TEKHNIKI APK in Russian No 2, Mar/Apr 93 [Signed to press 06 Apr 93) pp 14-15

[Article by A. F. Smirnov, Laboratory Chief, and V. M. Alimov, Manager, Long Range Prediction Group, Applied Astrogeophysics Laboratory, "Asstrol" Association]

[Abstract] Two inventions are presented which are significant for improving agricultural yields and predictability. The first is a method for long-term prediction of temperature and precipitation, based on calculations of the tide-forming forces exerted by the sun, moon, and the major planets. An accuracy of 70% for this method has been demonstrated in West Siberia and Kazakhstan. The second invention is an electromagnetic method for inducing precipitation. A 1992 field trial of both of the methods in the Aktyubinskiy oblast, where calculations showed a trough in an 8-year quasiperiodic rainfall cycle, resulted in a doubling of April precipitation. Record yields of 1400-1600 kg/hectare were achieved. Wider use of both inventions in future years is strongly recommended. Figures 1.

Production and Characteristics of Rice Clones Resistant to Stress Factors

937C0322a Moscow FIZIOLOGIYA RASTENIY in Russian Vol 40 No 4, Jul- Aug 93 [Manuscript received 26 Mar 92] pp 681-685

[Article by S. L. Belyanskaya and E. B. Shamina, Institute of Plant Physiology imeni K. A. Titiryayev, Russian Academy of Sciences, Moscow; UDC 581.143:6]

[Abstract] A method for obtaining rice resistant to high levels of sodium chloride, polyethylene glycol, and ethionine was developed. Callus tissue obtained from mature germ cells of Oryza sativa L. Soyuzniy-244 was cultivated in Murasig-Skug medium containing 4 mg/L 2,4-D. When N-nitroso-N-methylurea (NMM) mutagen was not used, the adaptive variants isolated died within 3-5 subsequent passages in the selective medium. Treatment with 4 mM NMM led to about 4

resistant colonies after seven passages for all three stressors. Stable, viable resistant colonies were isolated from the resistant colonies, with the stable colonies exhibiting differing responses when cultivated without the selective factors. Colonies which grew faster than the control were isolated only with ethionine. About 40

of the clones thus obtained exhibited cross-resistance to one of the two other stressors, while 5%-10% exhibited cross-resistance to both. This indicates that various resistance mechanisms developed during the mutation process. Further work is necessary to determine whether the resistance will be maintained in regenerated intact plants. Figures 2; references 11: 9 Russian, 2 Western.

Callus-Forming Capability of Immature Wheat Embryos During Storage at Low Temperatures

947C0039A Kiev PROBLEMY KRIOBIOLOGII in Russian No 2, Apr-Jun 93 (manuscript received 20 Feb 91) pp 39-43

[Article by V.D. Manuilskiy, A.M. Bondarenko, and A.N. Zubar, Institute of Plant Physiology and Genetics, Ukraine Academy of Sciences, Kiev]

[Abstract] A study explored ways of maintaining the callus-forming capability of immature wheat embryos after storage at temperatures as low as -196°C. Experiments were performed on seeds of Kharkovskiy II winter wheat that had been isolated from plants grown under field conditions 16-20 days after self-pollination. Embryos were extracted from the seeds after sterilization under laboratory conditions. The embryos were placed into solutions of dimethyl sulfoxide [DMSO] cryoprotector for varying amounts of time to establish optimum cryoprotection regimens. Next, the embryos were subjected to prolonged dehydration over $CaCl_2$, frozen to the temperature of liquid nitrogen (-196°C) at a rate of 280-300°C/min, and thawed at a rate of 180-200°C/min. The embryos were cultured in Gamborg B_5 medium. Calluses were obtained in Petri dishes at a temperature of 29 +/- 0.5°C. The best results were achieved when the embryos were treated with a 0.5 percent DMSO solution prior to freezing, in which case between 58.3 and 62.4 percent of the embryos survived after freezing to 196°C. Alterations in the freeze-thaw regimens generally caused a decrease in the number of morphogenetic calluses. The studies of various dehydration regimens established that dehydration temperatures of 2 to 4°C for no more than 3 days and dehydration of no more than 10 g of immature wheat embryos in a single layer in a Petri dish at a height of 3-4 cm above the $CaCl_2$ surface are best. Figure 1, tables 2; references 10: 8 Russian, 2 Western.

Prognostic Significance of NBT Test in Patients with Icterhemorrhagic Leptospirosis

937C0348a Moscow KLINICHESKAYA LABORATORNAYA DIAGNOSTIKA in Russian No 4, Jul-Aug 93 [Manuscript received 29 Jul 93] pp 22-25

[Article by M. G. Avdeyeva, G. V. Melnik, V. V. Lebedev, and M. G. Shubich, Kubanskiy Medical Institute imeni Krasnoy Armii, Krasnodar; UDC 616.98:579.834.115]-037:616.155.034-078.3

[Abstract] The use of the nitroblue tetrazole (NBT) test to predict the severity of an icterohemorrhagic leptospirosis infection and the probability that complications will develop was studied in 143 male and 5 female patients ages 16-69. Patients with mild leptospirosis exhibited elevated NBT test results during the second week of infection; those with moderate infections had elevated NBT test results during both the first and second week. In 18 patients with serious infections NBT test results were elevated, while in 51 they were depressed. The latter group had the most severe disease progression and toxic symptoms. All five deaths seen were in this group. S. aureus stimulated higher NBT test results in most subjects. The most unfavorable situation, depressed results of both the spontaneous and stimulated NBT test, was seen in 10 patients with the most severe disease, including the five who died. Leptospirosis vaccine depressed NBT test results in all patients except those whose results were already extremely depressed due to the most serious infections, where results were unchanged. In recovering patients who experienced complications during recovery the leptospirosis vaccine depressed results persisted, while in patients with uncomplicated recoveries they did not. Figures 1; references 10: 7 Russian, 3 Western.

Solid Phase Enzymatic Oligoribonucleotide Synthesis. 1. Synthesis on 4B Sepharose Hydrazide

947C0070F Moscow BIOTEKHNOLOGIYA in Russian No 5, Sep-Oct 92 pp 88-91

[Article by N.I. Komarova, N.F. Troitskiy, V.I. Yamkovoy, Novosibirsk State University and Novosibirsk Bioorganic Chemistry Institute at the Siberian Department of Russia's Academy of Sciences; UDC 577.113.6]

[Abstract] The general principles of solid phase enzymatic synthesis of oligoribonucleotides are discussed, and the specific application whereby 4B sepharose hydrazide prepared from adipic acid dihydrazide and CNBr-activated 4B sepharose is used as the sorbent for immobilizing the oligoribonucleotides oxidized under the effect of sodium periodate is considered. The advantage of this method is that there is no need to use "cushions" from easily flowing gel. The experiment design and the domestic and imported preparations used in the study are outlined, and particular attention is given to immobilizing the dialdehyde derivatives of oligoribonucleotides on 4B sepharose hydrazide, solid-phase ligation, solid-phase phosphorylation, and solid-phase synthesis of $(Ap)_{12}$. The reactivity of various types of immobilized oligoribonucleotides with different lengths in the above reactions and the saturating concentrations of the RNA-ligase and polynucleotide kinase are determined and the ligation time is measured. By selecting adequate column washing conditions after the kinase reaction, the researchers were able to complete two steps of solid-phase enzymatic synthesis; the end product yield in the sequence of 1st ligation→1st washing→phosphorylation→2nd washing→2nd ligation→3d washing→elimination→analysis was 25%. Figures 2; tables 5; references 13: 10 Russian, 3 Western.

L-Lysine Biosensor Based on pCO_2 Conductometric Transducer

947C0070H Moscow BIOTEKHNOLOGIYA in Russian No 5, Sep-Oct 92 pp 110-111

[Article by S.G. Ignatov, S.N. Andreyev, S.F. Dragunova, All-Russian Scientific Research Institute of Applied Microbiology, Obolensk, Seprpukhov rayon, Moscow oblast; UDC 547.466.46]

[Abstract] The importance of accurately measuring the lysine concentration in industrial production and clinical analyses and the shortcoming of existing methods prompted the development of a simple technique for immobilizing the enzyme on a cellulose septum in order to determine the lysine concentration using a conductometric pCO_2 electrode. To this end, L-lysine from *E. coli* produced by the Sigma company in the United States and Vladipor cellulose membranes made by Tasma are used. To produce an enzymatic electrode, the cellulose membrane from a filter with immobilized enzyme was placed on the surface of the original pCO_2 electrode with a 1 cm diameter. The resulting biomodule was placed on the surface of a modified domestic pCO_2 electrode where it was fastened with the help of a dialysis membrane and an elastic band. A block diagram of the L-lysine concentration measuring system, the dependence of the L-lysin sensor activity on pH, and the effect of the measurement temperature on the lysine sensor sensitivity are plotted. The findings confirm that the proposed biosensor is suitable for measuring the lysine concentration in solutions without using chemical reagents and for examining the inhibitory effect of pesticides. The optimum pH and operating temperature of the biosensor are 6.0 and 37°, respectively, and its response is flat within a 0.4-8 mM range. Figures 3; references 6: 2 Russian, 4 Western.

Biodegradation of Plant Waste by *Pleurotus Ostreatis* Fungus. 1. Formation of Biologically Valuable Products

947C0070D Moscow BIOTEKHNOLOGIYA in Russian No 5, Sep-Oct 92 pp 65-68

[Article by Z.R. Akhmedova, Microorganism Biochemistry and Physiology Institute at Russia's Academy of Sciences, Pushchino; UDC 582.284:577.152.32]

[Abstract] A growing trend in today's biotechnology—bioconversion of rapidly accumulating reserves of wood pulp waste, particularly with the help of wood-degrading fungi—and the problem of growing basidiomycete fungi of the *Pleurotus* genus are outlined, and their advantages over other fungi are discussed. Consequently, the formation of biologically valuable products, i.e., proteins, carbohydrates, and lipids, during deep cultivation of the fungus *Pleurotus ostreatis* in plant waste is investigated, and the products of lignocellulose degradation and the chemical composition of the substrates used are examined. To this end, the local strain of the fungus *Pleurotus ostreatis (Fr) Kumm* was extracted from the trunk of poplar trees growing in the cotton producing area of Tashkent, and the active strain which degrades lignin into cellulose was selected during the screening. Hemp mallow chaff, cotton stems, rice hulls, and depleted cotton seed ground oil cake bagasse were used as the test waste for conversion. The experiment shows that agricultural plant waste containing various amounts of lignocellulose is actively utilized by the local strain of the *Pleurotus ostreatis* fungus forming the above valuable products. The high protein, carbohydrate, and lipid concentration in the culture medium and enrichment of the resulting substrates with biologically valuable products as well as the carpous body development (with a 0.2-0.4 cm size) make it possible to use the plant waste thus treated as animal feed in agriculture. It is noted that the fungus apparently utilizes dioxan lignin from the hemp mallow chaff thus altering the functional group concentration, this is accompanied by a noticeable decrease in the carboxyl, carbonyl, general hydroxylic and aliphatic, and methoxyl groups. Tables 8; references 8: 4 Russian, 4 Western.

Plasmids From *Clostridium Thermosaccharolyticum* as Potential Vectors for Genetic Engineering Manipulations With Thermophilic Clostridia

947C0070B Moscow BIOTEKHNOLOGIYA in Russian No 5, Sep-Oct 92 pp 27-34

[Article by N.G. Belogurova, Ye.P. Delver, S.V. Kalyuzhnyy, A.A. Belogurov, S.D. Varfolomeyev, Moscow State University imeni M.V. Lomonosov and Experimental Cardiology Institute at the Russian Cardiology Research Center; UDC 579.252.5]

[Abstract] Interest in thermophilic *Clostridium* bacteria due to the presence of promising energy sources among their metabolism products, e.g., ethanol, butanol, and hydrogen, and organic acids and commercially valuable enzymes, prompted a detailed investigation into the characteristics of new plasmids from *Clostridium thermosaccharolyticum* which are promising for engineering clostridia on their basis and for more general gram-positive anaerobic bacteria. *C. thermosaccharolyticum DSM 571* and other strains without a precise classifications were used in the study together with the pUC12, pUC18, pBR322, and other vectors. The anaerobic microorganisms were cultivated using Hangate technology, and *E. coli* bacteria were grown in liquid and gelled LB media. Screening of 200 strains made it possible to discover two hitherto unknown plasmids—pNB1 and pNB2—with a molecular mass of 5.15 and 1.88, respectively. The plasmids display considerable homology; they were cloned into the above series of *E. coli* vectors, and a number of hybrid plasmids which may be treated as potential shuttle vectors for genetic engineering manipulations were constructed on their basis. The experiment revealed two types of kinetic plasmid behavior in growing cellular populations and helped to determine the complete nucleotide sequence of both strands of the pNB2 plasmid (1,882 kB) for subsequent computer analysis. It is emphasized that based on the data of the assumed pNB2 ori localization, it was possible to construct a number of hybrid plasmids using standard elements, such as ColEl ori, stability genes for *E. coli*, and gram-positive bacteria, which are useful for future genetic engineering research. Figures 11; references 13: 1 Russian, 12 Western.

Cell Cultures Association

937C0435A Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 p 64

[Article under the "Advertisement" rubric: "Cell Cultures Association"]

[Text] The Cell Cultures Association was created in January 1991 and has the status of a public organization. Its members include both individual researchers and scientific institutions and production enterprises that use cultured cells in basic and applied research and in manufacturing. The Cell Cultures Association's charter was published in the No. 10 issue of the journal TSITOLOGIYA [Cytology] in 1991.

The Cell Cultures Association conducts the following types of activity: provides information and expert services; activates practical ties between science and manufacturing; sets up biological and performance tests of newly created and manufactured products, instruments and units used in biotechnology manufacturing processes, and laboratory equipment; establishes enterprises and organizations needed to perform the tasks stipulated by the association charter; makes international contacts in the field of developing and using cell cultures; sets up ties with foreign organizations and data bases and training periods for young specialists in foreign laboratories; and helps its members participate in international conferences and meetings.

The Cell Cultures Association appeals to directors of organizations and individuals working with cell cultures and supplying the materials, instruments, equipment, and cell lines for their work, and it invites them to join the association and take active part in its activities. Your participation in all forms of the association's activity and joint work within the framework of the association based on mutual trust and respect for common interests will facilitate the success and further development of scientific and applied research on cell cultures in our country.

In 1992 students pay an entry fee of 10 rubles and yearly dues of 10 rubles, and scientific associations at enterprises and other citizens pay entry and yearly dues of 25 rubles each. Juridicial persons play an entry fee of 5,000 rubles and yearly membership dues of 3,000 rubles.

Individuals send their dues by mail or telegraph transfer to the Cell Cultures Association's secretary at the following address: 194064, Saint Petersburg, Tikhoretskiy pr., 4, A.I. Gusevoy.

Juridicial persons (organizations) send their entry fees and yearly dues to the following current account: Cell Cultures Association, RS 609244, Petrovskiy Commercial Bank, TsRKTs GU, Saint Petersburg Branch, Russian State Bank. KS 41001161091. MFO 161007.

The Cell Cultures Association welcomes everyone who has decided to become one of its members and expresses its hope for productive, constructive joint activity directed toward performing the tasks that have been stipulated. Inquiries may be directed to the following telephone numbers in Saint Petersburg:

247-42-96—Georgiy Petrovich Pinayev, 247-39-83—Alla Ivanovna Guseva, 247-53-10—Margarita Stanislavovna Bogdanova.

Culturing Mammal Cells on Biologically Active Polymer Film Substrate

937C0430B Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 (manuscript received 24 Feb 92) pp 15-17

[Article by A.V. Fedotova, A.G. Snezhko, A.V. Fedotov, L.P. Dyakonov, N.S. Belavkina, and E.G. Rozantsev, Moscow Institute of Applied Biotechnology, and All-Union Institute of Experimental Veterinary Medicine imeni Ya.R. Kovalenko; UDC 57.085.23.083.3]

[Abstract] A new biologically active polymer film substrate has been developed for culturing mammal cells. The new substrate is based on a combination of natural and synthetic polymers and is an aqueous solution modified by polyvinylpyrrolidone with gelatin. A study was conducted to examine the new polymer film substrate's ability to immobilize and proliferate cell cultures by way of the example of primary and graft animal cell lines. Primary cell lines were obtained from fetal pig intestines, lamb testicles, and lamb heart, and graft cell lines were obtained from fetal pig kidney, lamb kidney, fetal calf trachea, and pig thyroid gland. The polymer film substrate was prepared as follows: a day after its liquid components were mixed and held at a specified temperature, the films were formed so that the flat face of the culture vessel was evenly wet with the composition to produce a continuous homogeneous layer. The films were formed at 25° by removing their moisture. The structure of the resultant film was fixed at 60° for 1 hour. After the polymer film substrates had been prepared, they were rinsed with Hank's solution and sterilized at 130°C for 1 hour and 0.5 hours. The cells were grown in standard Eagle's media with 10 percent donor calf blood serum added. Cells grown on glass and plastic substrates served as controls. Each experiment was repeated five times. The effectiveness of the new polymer film substrates was evaluated by the time and nature of the monolayer formed, the proliferation index, and the nature of the cells' growth and morphology. The new polymer film substrate was demonstrated to possess growth-stimulating properties and to make it possible to standardize culture conditions when its surface is modified by adhesion factors in the cell lines studied. Cell monolayers grown on the new polymer film substrate lived 4-5 days longer than those grown on the control substrates. Between 25 and 30 percent more cells were produced when the new polymer film substrate was used, and the morphological indicators of cells produced on the new substrate were superior to those of cells produced on the glass and plastic substrates. Figures 4, tables 2; references 6: 4 Russian, 4 Western.

Using Polyvinyl Alcohol Cryogels in Biotechnology. IV. A Review of the Literature Data

937C0430A Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 (manuscript received 24 Feb 92) pp 5-14

[Article by V.I. Lozinskiy, A.V. Vakula, A.L. Zubov, Foodstuffs Institute, Russian Academy of Sciences, Moscow; UDC 678.744.72:577.083.134]

[Abstract] Polyvinyl alcohol [PVA] is one of the most attractive polymers used for biomedical purposes. Included among its advantages are its biocompatibility, nontoxicity, availability, and relatively low cost. In addition, it is not a carbon source for microorganisms and is not infected by them. PVA-based cryogels are formed by freezing concentrated aqueous solutions of PVA, holding them in their frozen state for a specified time, and then thawing them. The properties of PVA cryogels have been shown to depend on the characteristics of the polymer itself (molecular weight and degree of deacetylation), its concentration in the starting solution, the nature of the solvent, and the conditions under which the gel is produced (temperature and duration of freezing, thawing regimen, etc.). The mechanical properties of PVA cryogels can be improved significantly by multiple freeze-thaw cycles. A PVA cryogel's supermolecular structure and, accordingly, its strength and diffusion characteristics, may be controlled to some degree by varying the temperature and time parameters of the gel-freezing regimen. PVA cryogels may be used as the basis of dense nutrient media and have also been used successfully as a dense base for media used to grow plant cells (e.g., undifferentiated tissues of *Panax ginseng* and *Phodiola rosca* and virus-free potatoes from meristematic cells and selected higher hybrids. PVA cryogels have also been used as carriers of immobilized cells. Studies have, for example, demonstrated that a culture of *Serratia marcescens* immobilized in PVA cryogel during its exponential growth stage is more resistant to short-term temperature and mechanical effects (60° for 45 seconds plus pulverization in a manual homogenizer) than a free culture in the same phase is. PVA cryogels are very promising for use in medicine inasmuch as they meet many of the requirements stipulated for materials intended for contact with the body's blood and tissues and because they remain stable in physiologic solutions. PVA cryogels can also be sterilized by γ-radiation or by chemicals. PVA cryogels produced by partial lyophilization meet the standards set for acute toxicity and apyrogenicity and do not cause hemolysis or rejection reactions when implanted in the body. Another important feature of PVA cryogels is that their Young modulus is close to that of the body's soft tissues and that the mechanical properties of PVA cryogels produced by repeated freezing-thawing are close to those of cartilage. In view of the availability and relatively low cost of PVA itself, the problems of upscaling production of PVA cryogels should be relatively easy to solve, especially since ultralow temperatures are not required to produce cryogels. Figures 7, tables 2; references 98: 39 Russian, 59 Western.

Methane Digestion of Liquid Manure in "Anaerobic Biofilter"-Type Reactors

937C0430F Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 (manuscript received 18 Mar 92) pp 36-41

[Article by A.N. Nozhevnikova, A.A. Kovalev, V.K. Nekrasova, V.B. Kostyuk, V.R. Kryukov, and S.L. Venetskaya, Microbiology Institute, Russian Academy of Sciences, Moscow, and All-Russian Electrification of Agriculture Institute, Moscow; UDC 628.353:579.85]

[Abstract] First-generation reactors (i.e., methane tanks) based on a tube or complete mixing principle are currently used for anaerobic treatment of semiliquid manure generated in livestock production (i.e., manure containing 4-8 percent dry material). One promising way of increasing the operating efficiency of anaerobic reactors for liquid manure is to develop methods of increasing the concentration of active methane-forming biomass and retaining it in the reactors. A study examined processes of attaching acetate-using methanogens to the surface of various carrier materials and forming biofilms on them when processing the liquid fraction of manures. The efficiencies of various carrier materials were compared under laboratory conditions to determine the feasibility of using them in agroindustrial units and to develop a process flow for processing the manure generated at pig farms with 10,000 swine. The thermophilic methanogenic association CA-1003 used in the studies contained *Methanothrix thermoacetophila*, *Methanosarcina thermophila*, and the mesophilic methanogenic association CA-1002. A 15-l-capacity "anaerobic biofilter"-type reactor produced by LKB (Sweden) was used in the experiments, which were performed at a temperature of 53-57°. The digestive medium consisted of 7 l Pfennig mineral medium plus 1 l sterilized pig manure, 1 l *CA-1003* bacterial starter, 50 g sodium acetate, 5 g sodium sulfide, and 18 g sodium bicarbonate. The medium had a starting pH of 7.0 and a total moisture content of 99.6 percent. The acetate was added periodically as it was used up. A peristaltic pump was used to circulate the digested material at a rate of 2 to 5 reactor working volumes per day. The study carrier materials were mounted on glass frames (8 x 22 cm) that were placed vertically in the fermenter's working space. Four bioreactors were used: The first did not contain a carrier material, the second contained a carrier in the form of 15-cm-diameter corrugated keramzit-filled plastic pipes, the third contained a glass-fiber mat as a carrier, and the fourth contained asbestos cord as a carrier. Microbial biofilms containing methanogenic microflora formed on the surface of the different materials. The reactors with a fixed load were twice as efficient as the control reactor. After 3 months, the reactor with the keramzit carrier material had the highest biogas yield: 1.5-1.6 l/l of digested mass daily (versus 0.7-0.8 l/l/d for the control reactor, 1.0 l/l/d for the reactor with the glass-fiber mat, and 0.8-0.9 l/l/d for the reactor with the asbestos). The efficiency of the reactor with the keramzit filler was attributed to the leaching out of microelements (especially iron) and the formation of FeS. Treating the manure in four sequentially connected reactors boosted treatment (purification) efficiency. The laboratory study findings were used to develop a process and experimental commercial unit to treat 100 m^3 of liquid manure generated at pig farms daily. Tests of the new process and unit conducted in spring-autumn 1991 demonstrated the high operating efficiency of anaerobic biofilters: The degree of purification of the liquid manure fracture reached 60-65 percent, and the content of organic matter in the treated waste did not exceed 1,000 mg/l. Figures 4, tables 5; references 11: 10 Russian, 1 Western.

Comparative Study of the Process of Biotransformation of Cellulose-Containing Substrates by Micromycetes of the Genus *Aspergillus* in a Fermenter With a Mixer and in an Airlift Fermenter

937C0430E Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 (manuscript received 5 Mar 92) pp 30-32

[Article by S.A. Yeremkina, V.N. Sokolov, and A.I. Ginak, Saint Petersburg Technological Institute; UDC 582.282.123]

[Abstract] Biotransformation of lignocellulose materials and agricultural wastes and enrichment of the said materials with protein so as to increase their nutrient value are among the most promising ways of increasing the livestock production feed base. In view of this fact, a study was conducted to identify and compare the effectiveness of several methods of biotransformation of wheat straw by micellar fungus. The micellar fungus *Aspergillus* BKMF-3101 D isolated from activated sludge of the scrubbing equipment at the Arkhangelsk Paper and Pulp Combine was used in the experiments along with a nutrient medium with the following composition (g/l): KH_2PO_4, 2.0; NH_4NO_3, 5.0; $MgSO_4 \cdot 7H_2O$, 0.5; wheat straw ground to 0.5-0.6 mm, 20; and tap water, 1 l. The micromycete was grown under deep conditions. An ANKUM-2M fermenter and airlift fermenter were used. The material produced in the ANKUM-2M fermenter contained 23.6 percent protein in its solid phase after 26 hours of culture, which translates into a protein productivity of 0.145 g protein/(l x h) and a 65.2 percent cellulose recovery. The material produced in the airlift fermenter after 14-18 hours of culture had a protein content of 26.9 percent, which is equivalent to a protein productivity of 0.26 g protein/(l x h) and a 75.0 percent cellulose recovery. In addition to resulting in better product indicators, the airlift fermenter provided the additional advantage of reduced fermentation time (which means a decrease in the likelihood of product contamination). Figures 2, tables 3; references 11: 10 Russian, 1 Western.

Purifying Tetanus Toxin by Affinity Chromatography on Reversed-Phase Sorbents With Adsorbed Gangliosides

937C0430D Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 (manuscript received) pp 22-25

[Article by I.A. Mezin, R.F. Menzeleyev, Ye.N. Zvonkova, Yu.M. Krasnopolskiy, and V.I. Shvets, Biolek Enterprise for Production of Immunobiological and Medicinal Preparations, Kharkov, and Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov, Moscow; UDC 577.157.3]

[Abstract] Gangliosides are acidic glycosphyngolipids that are known to play an important role in processes of cellular differentiation and reception of selected hormones and bacterial toxins. Using the affinity of various gangliosides to toxins produced by bacteria has made it

possible to create affine sorbents that may in turn be used to purify and study the properties of the said toxins. The existing method of producing sorbents with immobilized gangliosides is laborious and unsuitable for large-scale separation of toxins under industrial conditions. A study was thus conducted to produce an easily accessible sorbent with immobilized gangliosides that could be used for affinity purification of tetanus toxin. A tetanus toxin solution with an activity of 350,000-400,000 DLM [as published]/ml and a protein concentration of 8-10 mg/ml was used. The individual gangliosides G_{T1b}, G_{D1a}, G_{D1b}, and G_{M1} and bovine serum albumin were used as standards. The individual gangliosides were separated and adsorbed on reversed-phase sorbents (Lichrosorb RP-8, Diasorb S-16/200 and 400, Diasorb S-8/200T, and Octyl-Sepharose CL-4B). The binding of the tetanus toxin with the affine sorbents was studied after it had first been concentrated and purified. The effect of the following factors was studied: the type of matrix possessed by the sorbent, density of the grafted alkyl groups, and composition of the adsorbed gangliosides. Octyl-Sepharose with the adsorbed ganglioside G_{T1b} proved most effective in purifying tetanus toxin. After affinity purification, the concentration of tetanus toxin increased by a factor of 100-150, and the amount of protein decreased from 8.5-10 mg/ml to 40-46 μg/ml (i.e., by a factor of 180-220). Figures 5, table 1; references 15: 4 Russian, 11 Western.

Effect of Surfactants on the Luminescence System of Light-Emitting Bacteria

937C0430H Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 (manuscript received 17 Feb 92) pp 56-59

[Article by O.N. Postnikova, Yu.S. Krivoshein, and L.Yu. Berzhanskaya, Crimean Medical Institute, Simferopol; UDC 661.185+577.359+579.843.4]

[Abstract] The luminescence system of light-emitting bacteria is a biosensor that is sensitive to a broad range of chemical compounds contaminating the environment. Surfactants are among the most dangerous environmental pollutants because they are barely susceptible to biodegradation, have a high biological accumulation coefficient, and are used intensively in various sectors of the national economy. A study examined the effect of surfactants on the luminescence systems of the light-emitting bacteria *Vibrio fischeri* 6 and *Photobacterium leiognathi*. Cationic, amphoteric, and nonionogenic surfactants were examined in the in vivo studies. The effect of the various surfactants on the light-emitting bacteria was evaluated by the extinction of luminescence in the study bacteria versus the luminescence of controls (i.e., bacteria not exposed to surfactants). The minimum active concentration of surfactant was assumed to be that concentration that induced a 10 percent change in intensity of luminescence versus the controls. Amphoteric and cationic surfactants with 12 to 16 carbon atoms in their alkyl radical were found to have the most pronounced antimicrobial effect. The presence of a benzene ring in the hydrophobic portion of the compound was found to increase its activity. The studies also demonstrated that hydrophilic substituents make a significant contribution to the effect of surfactants on microbial cells and that among nonionogenic surfactants, the most effective substances are those with the lowest degree of oxyethylation. The results of this study are said to confirm the results of studies conducted on different groups of gram-negative bacteria with no bioluminescence properties. This fact, coupled with the now-proven possibility of making a quick and exact quantitative in vivo analysis of the effects of surfactants on light-emitting bacteria, led the researchers to recommend that photobacterial cultures be used as test systems for biological testing for the presence of different classes of surfactants. Figures 4, table 1; references 5: 4 Russian, 1 Western.

De Novo Protein With Specified Three-Dimensional Structure: Design, Production, and Research

947C0070A Moscow BIOTEKHNOLOGIYA in Russian No 5, Sep-Oct 92 pp 18-21

[Article by D.A. Dolgikh, A.N. Fedorov, V.V. Chemeris, A.V. Finkelshteyn, A.A. Shulga, A.E. Gabrielyan, O.B. Ptitsyn, M.N. Kirpichnikov, Molecular Biology Institute imeni V.A. Engelgardt at Russia's Academy of Sciences and Protein Institute at Russia's Academy of Sciences, Pushchino; UDC 577.21:577.322]

[Abstract] The development of the first *de novo* protein with a predetermined architecture which, however, occurs in natural proteins gave impetus to attempts to engineer a *de novo* protein whose structure does not occur naturally yet is not inconsistent with any known patterns or laws characterizing globular proteins. To this end, a protein is engineered and investigated. The protein—albebetin—has a specified three-dimensional αββαββ structure of two helixes lying on an antiparallel β-sheet which has never been observe naturally. The albebetin-coding gene was chemically synthesized and cloned in a plasmid with SP6 phage RNA-polymerase promoter and expressed in an mRNA-dependent noncellular translation system from wheat germ. Chemical reagents made by Amersham, Merck, Sigma, and Serva in the United States and Pharmacia (Sweden) as well as domestic agents were used in the study. Preliminary findings indicate that the new protein is capable of the blast-transforming activity since it has sufficient binding constant for the corresponding receptors on the thymocyte surface. If biologic testing confirms this conclusion, the proteins could become the first step toward a transition from engineering *de novo* proteins with a predetermined structure to developing *de novo* proteins with both a specified structure and function. The authors are grateful to Yu.B. Alakhov, V.P. Zavyalov, Ye.V. Navolotskaya, and B.K. Chernov. The study is financed by the grant under the State Scientific Engineering Program of the Newest Bioengineering Methods. Figures 7; references 18: 5 Russian, 13 Western.

Microbial Methods of Soil and Groundwater Decontamination

947C0070C Moscow BIOTEKHNOLOGIYA in Russian No 5, Sep-Oct 92 pp 60-64

[Article by L.A. Golovyleva, Microorganism Biochemistry and Physiology Institute at Russia's Academy of Sciences, Pushchino; UDC 631.427.2]

[Abstract] The urgency of the general problem of biosphere's interaction with the alien compounds entering it, especially those which survive in it for a long time and are accumulated at elevated levels, and the particular issues of biological methods for cleaning the soil and water from pollutants, i.e., utilizing the microorganisms' degradation activity, are addressed. An attempt is made to demonstrate that the microbial decontamination method based on the general principles of physiology and ecology is promising for soil and ground water purification. Possible methods include both soil treatment *in situ* and biological remediation in specially equipped devices. The effect of the substrate origin on the DDT degradation rate with the *Pseudomonas aeruginosa 640x* strain under anaerobic conditions, the behavior of the number of *Pseudomonas aeruginosa BS-827* cells with and without the BS 827 strain, and the dynamics of 2,4,5-T, 2,4,6-TCP, and PCP degradation under various microbial cultures are plotted, and the chlorophenol degradation by immobilized *S. rochei 303* cells, dehalogenase activity values in the cell-free *S. rochei* extract, and the values of oxyhydroquinon-1,2-dioxygenase activity in the cell-free *S. rochei 303* extract are summarized. The conclusion is drawn that microbial *in situ* decontamination methods have a great potential, and the key role in developing it belongs to microbiologists. Analyses demonstrate that although biological methods may be inexpensive, many problems must still be resolved for their successful application. It is noted that in developing microbial methods, emphasis must be placed on the inoculated cell viability, distribution in the soil, and anaerobic degradation, as well as the strain activity. Figures 6; tables 3; references 26: 10 Russian, 16 Western.

Biodegradation of Plant Waste by *Pleurotus Ostreatis* Fungus. 2. Enzyme Formation

947C0070E Moscow BIOTEKHNOLOGIYA in Russian No 5, Sep-Oct 92 pp 69-71

[Article by Z.R. Akhmedova, Microorganism Biochemistry and Physiology Institute at Russia's Academy of Sciences, Pushchino; UDC 582.284:577.152.32]

[Abstract] The enzyme-stimulated hydrolysis of the principal plant waste structure components, e.g., from cellulose, hemicellulose, and lignin to di-and monosaccharose, for subsequent production of the end product is discussed, and it is noted that although enzymatic cellulose degradation is well known, the process of lignin decomposition remains relatively unknown while the resulting data are rather contradictory. To address these issues, the component composition and accumulation dynamics of cellulolytic, xylanolytic, and ligninolytic enzymes by the local strain of the *Pleurotus ostreatis (Fr) Kumm* fungus participating in degradation of various types of plant waste are examined. To this end, 36 fungi cultures extracted from tree trunks and stumps, plant waste, and soil in cotton growing regions of Uzbekistan are tested. The formation dynamics of reducing sugars by the *Pleurotus ostreatis (Fr) Kumm* fungus, the protein and biomass accumulation dynamics of the *Pleurotus ostreatis (Fr) Kumm* in media containing hemp mallow chaff, cotton stems, and depleted cotton seed ground oil cake bagasse, and the maximum activity level accumulation of cellulolytic and ligninolytic enzymes by the fungus in media containing depleted cotton seed ground oil cake bagasse and other plant waste are plotted. The findings demonstrate that lignocellulose-containing plant waste in Uzbekistani agriculture can be utilized under the effect of cellulolytic, xylanolytic, and ligninolytic enzyme complexes secreted by the fungus under deep cultivation in media which contain these types of waste. Furthermore, 40-72% of cellulose, 50-85% of hemicellulose, and 27-45% of lignin are utilized. The ligninolytic complex of the fungus contains such enzymes as laccase, peroxidase, and ligninase; the hemicellulose—xylanase; and the cellulolytic—endogluconase and cellobiase. The results show that the local strain of the *Pleurotus ostreatis (Fr) Kumm* fungus is a potential producer of enzymes, proteins, fungal biomass, and biologically valuable substances of great interest to biotechnology. Figures 3; tables 2; references 7: 5 Russian, 2 Western.

Biosensors Based on Liquid Crystal Dispersions of Double-Strand Nucleic Acids

947C0070G Moscow BIOTEKHNOLOGIYA in Russian No 5, Sep-Oct 92 pp 103-109

[Article by Yu.M. Yevdokimov, S.G. Skuridin, B.A. Chernukha, Molecular Biology Institute imeni V.A. Engelgardt at Russia's Academy of Sciences, Moscow; UDC 577.112.6]

[Abstract] Biosensors—devices containing a biological material immobilized on the transducer surface which quantitatively transform biological signals into electric—and the status of biosensor research and development are discussed, and the small number of commercially available biosensors is noted. The process of biosensor design which is reduced to solving two problems in two different fields of science—developing a design in which the recognition reaction is realized with the maximum efficiency and creating an adequate system for recording the signal forming in the system—is outlined, and emphasis is placed on the premises related to developing the simplest biosensors, particularly biosensors on the basis of liquid crystal dispersions of linear

nucleic acid molecules with a low molecular mass (under $1 \cdot 10^6$). The physical and chemical properties of the linear double-strand nucleic acid molecules, the abnormal optical activity of the liquid crystals and liquid crystal dispersions of nucleic acids, and particle conservation of the liquid crystal DNA dispersion within the synthetic polymer matrix are described in detail. An analysis confirms the possibility of developing liquid crystal DNA molecule dispersion-based biosensors. It is speculated that portable optical signal analyzers will be developed on the basis of these types of biosensors. Figures 8; references 18: 7 Russian, 11 Western.

Dynamics of the Fungal Mycelium Content in Stationary Observation Post Soils of the 30-km Zone Around the Chernobyl Nuclear Power Plant

937C0414A Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 55 No 4, Sep-Oct 93 (manuscript received 1 Jun 92) pp 8-15

[Article by A.I. Vasilevskaya, N.N. Zhdanova, and V.I. Gavrilyuk, Microbiology and Virology Institute, Ukraine Academy of Sciences, Kiev, and Nuclear Research Institute, Ukraine Academy of Sciences, Kiev; UDC 582.288.4:58.02+574.2]

[Abstract] The dynamics of the microbiota of radionuclide-contaminated soils at seven stationary observation posts located throughout the 30-km zone around the Chernobyl Nuclear Power Plant and at one observation post in the vicinity of Kiev (in Feofaniya) were studied in the period 1987-1989. The lengths of light- and dark-colored fungal mycelium in soil samples gathered at the said sites were determined by the membrane filters method. The soil samples' radioactivity was analyzed in terms of the season during which the samples were collected and the depth at which the samples were obtained. The radioactivity of the soil at each stationary observation post fluctuated during the course of the study and varied by soil depth. Overall, however, radioactivity levels remained high and decreased extremely slowly. Samples gathered at depths of 0-2 cm in settlements of Chistogalovka and Kopacha and at the Novo-Shepelichskiy forestry enterprise were highly contaminated, which is to say that they had radioactivity levels of 10^{-3} to 10^{-6} Ci/kg soil. Samples collected in the Novo-Shepelichskiy forest were less contaminated (radioactivity level, 10^{-5} to 10^{-7} Ci/kg soil). The radioactivity level of the soil from Feofaniya was lower (i.e., 10^{-7} to 10^{-9} Ci/kg soil). The radioactivity of soil sampled at a depth of 8-10 cm also fluctuated at all of the observation posts and was generally one to two orders of magnitude less radioactive than the soil sampled at depths of 0-2 cm. The dynamics of the content of dark- and light-colored fungal mycelium sampled at 0-2 and 8-10 cm was subject to seasonal variation (although no seasonal pattern extending from year to year was found). Generally, dark-pigmented mycelium predominated at the beginning of the study period, and light-pigmented mycelium began to predominate further on into the study. Throughout all the sampling sites, the amount of fungal mycelium present in the soil in the layer 8-10 cm below the surface was generally lower than in the 0-2 cm layer. The seasonal pattern observed at 0-2 cm was repeated at 8-10 cm below ground level. At most sites, the length of the dark-colored mycelium was nearly identical in both horizons studied (the only exception was the soil of the Novo-Shepelichskiy forest, where the amount of dark mycelium present at 8-10 cm was 2 to 7 times greater than at 0-2 cm below ground level). The highest amounts of light- and dark mycelium were found near Chistogalovka and in the Novo-Shepelichskiy forest and Novo-Shepelichskiy forestry enterprise, i.e., where the radioactivity levels were highest and where there was sloping forest. It was concluded that radioactive contamination of the soil is one significant component in an entire system of ecological factors dictating the dynamics of the content of fungal mycelium in soil. Figures 3; references 22: 16 Russian, 6 Western.

Toxic Effect of Combined Action of Ionizing Radiation and Halogenated Dibenzo-n-dioxins on Mammels

937C0342a Moscow DOKLADY AKADEMII NAUK in Russian Vol 331 No 4, Jul 93 [Manuscript received 23 Mar 93] pp 369-371

[Article by A. D. Kuntsevich, academician, S. I. Baulin, V. F. Golovkov, V. R. Rembovskiy, and N. M. Troshkin, Center for Ecotoximetry, Russian Academy of Sciences, Moscow; UDC 502.7]

[Abstract] The combined effect of intragastric 2,3,7,8-tetrachlorodibenzo-n-dioxin (TCDD) and external gamma, or intraperitoneal I-131 or P-32 radiation was studied in white mice. As measured by 30-day mortality, TCDD plus any of the radiation types gave a supra-additive effect. For gamma and P-32 radiation, the radiation had a greater contribution to the effect than the chemical. With gamma radiation, 100% mortality was seen at a combined dose of 0.96% the gamma radiation LD_{50} plus 0.04% the TCDD LD_{50} and at 0.64% plus 0.36%. With I-131 50% mortality was seen at 0.006% the I-131 LD_{50} plus 0.2% the TCDD LD_{50} and at 0.25% plus 0.1%, while with P-32 100% mortality was noted at 0.8% plus 0.2%. The results obtained indicate that TCDD can modify the biological effects of ionizing radiation in an unfavorable manner, and that this effect is particularly severe with I-131. References 8: Russian.

Identification of Gamete Mutations in Hypervariable Region of Human DNA for Purpose of Genetic Monitoring

937C0326a Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 329 No 6, Apr 93 [Signed to press 29 Dec 92] pp 785-786

[Article by N. P. Bochkov, Ye. I. Rogayev, Yu. K. Molyaka, A. B. Shlenskiy, and A. Yu. Asanov, Moscow Medical Academy imeni I. M. Sechenov; Scientific Center for Mental Health, Russian Academy of Medical Sciences, Moscow; UDC [575.167+577.224]:5.7.2]

[Abstract] The suitability of various probes in finding gamete gene mutations in the hypervariable regions of human DNA was evaluated. In addition the sample size required to compare the mutation levels of populations living in ecologically various regions was determined. DNA from 47 children and both parents was used. The DNA was hydrolyzed, separated by agarose gel electrophoresis, and reacted with ^{32}P-labeled probed. The presence in the child's DNA of bands which were absent in both patents was considered a result of gamete mutation. Probes 35.15 and 21.15 did not demonstrate adequate selectivity for polymorphism. The mild conditions required for hybridizations with probes RedI and RedII led to inadequate sensitivity. Probe 35.14 was best suited to genetic monitoring. Four of the 47 children had bands with this probe which were not seen in either parent. It was calculated that 100 persons and their patents must be tested to detect a two-fold increase in mutation rate, and 200 persons and their patents to detect at 50% increase. The method developed is promising for ecological genetic screening of the human genome. The project was partially financed by the Human Genome project. References 9: 2 Russian, 7 Western.

DNA-Probe To Identify Representatives of the Genus *Francisella*

937C0430G Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 (manuscript received 5 Mar 92) pp 52-55

[Article by L.V. Romanova, B.N. Mishankin, and N.V. Pavlovich, Rostov-na-Donu Antiplague Scientific Research Institute; UDC 579.841.95:579.254.22]

[Abstract] The technique of molecular cloning w. s used to design a pRD-6 plasmid with an 80-base pair *Eco*RI DNA fragment that is complementary to the species-specific segment of chromosomal DNA of tularemia microbe. Chromosomal DNA was obtained from *Francisella tularensis* 1015 cells. The techniques used to obtain the chromosomal and plasmid DNA, hybridize the DNA, localize the cloned DNA sequence, and determine its primary nucleotide sequence were as published elsewhere. Physical and functional maps of the cloned DNA segment were constructed. The study DNA fragment of tularemia microbe was found to contain to segments (19-49 and 766-796) manifesting 60 percent homology with segments of the plasmid pBR322 flanking the ampicillin resistance genes (4300-4330 and 3118-3148 nucleotides, respectively). The new plasmid was used to produce a radioactive probe for species-specific determination of *Francisella* species. Tests of the new probe confirmed that it hybridizes only with the DNA of representatives of the genus *Francisella* and not with the DNA of representatives of other closely or distantly related species of microorganisms (such as *Yersinia* and *Brucella*). The new radioactive probe was proved to have a sensitivity of 6 x 10^5 microbial cells and to make it possible to identify representatives of the species *Francisella* not only in cellular suspensions but also in smears (prints) of animals killed by tularemia infection. Figures 4, tables 2; references 12: 2 Russian, 10 Western.

Stimulatory Role of Spermatozoids in Ontogenesis of Mulberry Silkworm

937C0326b Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 329 No 6, Apr 93 [Signed to press 29 Dec 92] pp 790-791

[Article by V. A. Strunnikov, M. V. Pronyayeva, and Ye. A. Gubanov, Institute of Developmental Biology imeni N. K. Koltsov, Russian Academy of Sciences, Moscow; UDC 576.354.4.595.787]

[Abstract] The authors had previously developed a strain of completely homozygous mulberry silkworm capable of heat induced androgenesis, gynogenesis, and ameiotic parthenogenesis. In the current study, backcrossing, with the aid of a red worm (ch$^-$) marker gene, was used to study the reduced viability and cocoon weight of offspring from parthenogenesis. The viability of the offspring of gynogenesis was only 18% less than that of normal bisexual reproduction, while the viability of the offsping of ameiotic parthenogenesis was very low, about 20. The only difference between these two was that in gynogenesis activation was conducted 5-65 seconds after introduction of spermatozoids. Nuclear penetration of the spremazoids did not occur. The results indicate that, in addition to carrying genetic information and meiosis deblocking triggers, spermatozoids stimulate ontogenesis. They probably carry something which stimulates embryonic and postembryonic development. Elucidation of the nature of this stimulus could result in more effective development of methods for aftificial modification of animals. References 3: Russian.

Study of Teratogenic Effects in Population Using Model of Human Embryo Bone System

947C0059A Kiev TSITOLOGIYA I GENETIKA in Ukrainian Vol 27 No 4, Jul)Aug 93 pp 30,34

[Article by I.A. Syednyeva; Pediatrics, Obstetrics and Hereditary Pathology SRI, Lvyv]

[Abstract] The dynamics of teratogenic effects in the population of the city of Chernovtsy was studied using a model of the human embryo bone system. Thirty)five human embryos and fetuses, 6 to 12 weeks of gestation, were studied during the 1988 outbreak of total alopecia

in children; similar studies were also conducted in 1991 (30 embryos and fetuses) and 1992 (25). The bones were obtained during medical abortions from women who were permanent residents of the city of Chernovtsy. The author developed a new method for and technique of morphological analysis and morphometry of native cartilage models of upper and lower limbs of human embryo and fetus bones and their endochondral ossification zones. The technique makes it possible to obtain objective information within one hour after obtaining aborted material. A linear relationship between the length of a bone and the size of its ossification zone was observed. Cases of osteogenetic anomalies were detected. The number of such cases was much higher in 1991, and then decreased in 1992; no assessment is given, as the 1992 experimental sample was much smaller than in 1991. All cases of the pathology were detected in 9)12 week embryos. During the alopecia outbreak (1988) the spectrum of pathology of the embryo bone system was wider than in later years. It is suggested that a chemical in nature hazardous factor is at work in the Chernovtsy population. The need to continue dynamic observations of teratogenic effects during embryo development in Chernovtsy is stressed. Figures 2, tables 2, references 13: 8 Russian, 5 Western.©Institut kletochnoy biologii i geneticheskoy inzhenerii AN Ukrayiny, Institut agroekologii i biotekhnologii UAAN, "Tsitologiya i genetika", 1993

Short and Long Term Results of Radiation Effect on Rise of Native Defects of Locomotor System Based on Materials of Screening of Newborn in Kiev Maternity Wards

947C0059B Kiev TSITOLOGIYA I GENETIKA in Ukrainian Vol 27 No 4, Jul)Aug 93 pp 90,95

[Article by A.P. Krysyuk, Ye.P. Mezhenina, Ya.B. Kutsenok, Yu.M. Guk, T.A. Kinchaya)Polishchuk, R.V. Luchko, S.Ye. Guryev and A.Ya. Vovchenko; Ukrainian Traumatology and Orthopedics SRI, Kiev]

[Abstract] The increased share of native developmental defects (NDE) as causes of infant morbidity, invalidity and mortality is blamed to a large extent on ionizing radiation of the population caused by the 1986 Chernobyl AES (ChAES) accident. Dozens of forests and villages in a number of countries had been subjected to radioactive contamination. Women who gave birth to babies in 1986 and later have been subjected to prolonged low)dose radiation. At present the levels of external gamma radiation of Kiev residents are within the limits of natural radiation and strong technogenic background, due to a complex of hygiene measures. Screening of newborn in Kiev maternity wards wasT)0*0*0*00Tconducted to study the effect of radiation on mothers and their offspring in the first several months and during two years (1986)1988) after the accident, as well as over a longer period (five to six years) 1991)1992). Other factors besides radiation account for the rise of NDE. 15939 newborn were examined; 778 of them had NDE, and 12 of those had multiple NDE (MNDE). In 1991)1992 the NDE frequency was 28.7% higher than in 1986)1987. The structure of NDE during these periods was almost identical but there was a significant quantitative difference. Types of NDE detected in 1986, 1987 and 1991)1992 are listed. Data on mothers' ages and morbidity during pregnancy are presented. Differences between quantitative data are also attributed to the deteriorating ecological situation due to environmental contamination caused by industrial waste. To determine the effect of various hazardous factors on NDE and MNDE formation, data obtained in the 60s and 70s (before the ChAES accident) and after the accident were compared. The 28.7% increase is attributed to the radiation effect. The number of babies with NDE has been increasing in Kiev, which is also probably due to prolonged albeit low)dose radiation of women. At present radon and products of its disintegration are the main source (37%) of radiation of Kievites, 10% are due to ionizing radiation of construction materials, and 34% to medical procedures involving radiation. It is assumed that at present radiation doses have stabilized for several decades. It is recommended to reduce X)ray and fluorography examination of women in Kiev and limit the use of radionuclide diagnostic methods. Tables 2, references 18: 12 Russian, 6 Western.©Institut kletochnoy biologii i geneticheskoy inzhenerii AN Ukrayiny, Institut agroekologii i biotekhnologii UAAN, "Tsitologiya i genetika", 1993

Clinical and Cytogenetic Characteristics of Children Born to Persons Who Had Acute Radiation Sickness of First and Second Degree Due to Chernobyl Nuclear Power Plant Accident

947C0062A Kiev TSITOLOGIYA I GENETIKA in Russian Vol 27 No 4, Jul-Aug 93 pp 10-13

[Article by Ye.I. Stepanova, Ye.A. Vanyurikhina, Ukrainian Scientific Center of Radiation Medicine, Kiev; UDC 576.312.32.38:612.014.482]

[Abstract] The urgency of examining the impact of ionizing radiation on chromosomes of human somatic cells, especially due to the need to predict the risk of hereditary disease in the first generation of children of irradiated parents, prompted an investigation into the clinical and cytogenetic effects from the exposure to ionizing radiation among children born in 1987 and 1988 to parents who participated in the cleanup operations after the Chernobyl nuclear power plant accident and suffered acute radiation sickness of first and second degree. An attempt is made to draw the conclusions on the basis of a clinical genetic examination and cytogenetic analysis of the somatic cell chromosomes. To this end, 15 children whose fathers suffered from acute radiation sickness and a control group of 50 children born to healthy parents were examined, and a comprehensive two-stage approach was developed. A form containing personal and anthropometric data, clinical diagnosis, development pathology description, and all most frequent small development anomalies, i.e., dysembryogenesis stigmata, grouped by the common anatomical

localization principle was prepared. The findings point toward an increase in the specific gravity of the children who also display multiple dysembryogenesis stigmata, compared to the control group. The cytogenetic examination also reliably shows an increase in the rate of chromatide aberrations at the chromosome subsegment level compared to the control group. Figures 1; tables 2; references 7: 3 Russian, 4 Western.

Cytogenetic Disorders in Persons Involved in Chernobyl Nuclear Power Plant Cleanup Who Permanently Reside in Regions With Unfavorable Environmental Conditions

947C0062B Kiev TSITOLOGIYA I GENETIKA in Russian Vol 27 No 4, Jul-Aug 93 pp 14-19

[Article by V.M. Frolov, N.A. Peresadin, Ye.F. Safonova, I.R. Barilyak, Lugansk Medical Institute and Ukrainian Scientific Center of Medical Genetics at the Ukrainian Public Health Ministry and Academy of Sciences, Kiev; UDC 575.174.2:618.33:618.39]

[Abstract] The proliferation of medical and social problems stemming from Chernobyl, particularly the issue of rehabilitating the persons exposed to low doses of ionizing radiation and psychological and emotional stress reinforced by an increased awareness of the harmful effect of radiation on humans, prompted a study of the cytogenetic indicators among the persons involved in the Chernobyl nuclear power plant accident cleanup with regard to the region of their subsequent residence and their clinical and immune status. To this end, 1,626 cleanup team members, 1,602 of them (or 98.6%) men aged 22-40 hospitalized due to clinical indicators at the Neurological Department of the Lugansk oblast hospital in 1989-1993, were examined. Allowing for clinical data and additional instrument-assisted examination, e.g., electro-, rheo-, and echoencephalography, computer-assisted tomography of the brain, and electrodermothermometry, made it possible to identify dyscirculatory encephalopathy (DE) in 732 persons or 45.0% of patients, vegetovascular dystonia in 819 or 50.5% of patients, hypertension disease with frequent cerebral crises in 75 or 4.6% patients, and acute cerebral blood circulation disorders in 6 or 0.37% of patients. Additional disorders were revealed by ultrasonic examinations. The findings reliably confirm an elevated frequency of chromosomal aberrations among persons suffering from neurological and psychiatric disorders, stress, and somatic pathologies. In the cases where these persons reside in areas with a high level of environmental contamination in the biosphere, an elevated level of chromatide aberrations is recorded, attesting to the effect of chemical mutagens on the lymphocytes' genetic system. In areas with a relatively relaxed environmental status, favorable conditions are developing for eliminating the unstable chromosomal aberrations due to the renewal of the circulating lymphocyte pool; chromosomal aberrations are closely correlated with the degree to which secondary immunodeficiency is manifested. Tables 2; references 15.

Detection and Assessment of Total Mutagenic Activity of Aerosol Portion of Chemical Contamination of Atmospheric Air in Certain Industrially Developed Ukrainian Cities

947C0062D Kiev TSITOLOGIYA I GENETIKA in Russian Vol 27 No 4, Jul-Aug 93 pp 34-39

[Article by A.M. Dugan, I.R. Barilyak, V.S. Zhurkov, Ukrainian Scientific Center of Medical Genetics, Kiev; UDC [576.851.94+375.113]614.7]

[Abstract] The small number of hygienic regulations established with respect to the mutagenic danger and the inability of traditional analytical methods to draw conclusions about the real mutagenicity of air contamination necessitated a search for new approaches to assessing the real, i.e., total, mutagenic activity of complex aerosol mixtures in environmental contamination. One such approach based on testing assays from the environment is utilized in order to evaluate the qualitative status of the atmospheric air over certain industrially developed Ukrainian cities by the indicators of chemical contaminants' total mutagenic activity. To this end, histidin-dependent strains of *Salmonella typhimurium TA 98* and *Salmonella typhimurium TA 100* are used in Ames's microsome test in such metallurgical industry centers as Mariupol, Zaporozhye, Krivoy Rog, Donetsk, and Makeyevka according to Fonshteyn's methodological recommendations (modified by the authors). The former strain detects mutagens which induce mutations shifting the genetic code reading frame while the latter—mutations which substitute the base pairs. During the experiment, 100 m^3 air samples were taken through AFA-VP-20 filters weekly at all weather stations. DDDTDP and potassium bichromate were used as positive control agents. The mutagenic activity of the aerosol portion of the atmospheric air's chemical contamination in B.N. Ames's test is plotted. The study shows that in Mariupol, frame shift mutagens which cause a "moderate" degree of mutagenic activity are dominant; in general, chemical contamination in these cities displays mutagenic activity both with and without the S-9 fraction, i.e., mutagenicity does not depend on the metabolic activation system: roughly the same quantity of both indirect and direct mutagens are found in the air, while the cities can be arranged in the following sequence according to the degree of bioeffect manifestation: Mariupol→Zaporozhye→Donetsk→Krivoy Rog→Makeyevka. Figures 1; references 17: 7 Russian, 10 Western.

Assessment of Mutagenic Background and Mutability in Population of Regions With High Intensity of Pesticide Use

947C0062E Kiev TSITOLOGIYA I GENETIKA in Russian Vol 27 No 4, Jul-Aug 93 pp 82-86

[Article by A.I. Kurinnyy, A.P. Kravchuk, Ye.S. Zubko, Ukrainian Scientific Research Institute of Environmental Hygiene and Toxicology of Chemical Substances, Kiev; UDC 614.7:613.00577.482]

[Abstract] The need to ensure effective genetic-environmental monitoring of mutagens and arrest the growth of genetic etiology pathology calls for addressing a broad range of issues; this can be accomplished only by means of large-scale comprehensive environmental genetic research aimed at developing a classification of the regional mutagen contamination status, mutagenic background mapping, and environmental standardization. To this end, an attempt is made to evaluate the mutagenic background and mutability in humans residing in regions with a intensive use of agricultural chemicals. The study was carried out in two agricultural regions of Uzbekistan located at a 200 km distance from each other. The first region is in the steppe zone and is a cotton growing area with an annual pesticide use of 36 kg/ha; it has a central water supply system and a population of 6,000. The second is located in a piedmont area at an elevation of 1,500 m; it is engaged in multiple crop agriculture and animal husbandry; water is drawn from wells, and the area population is 7,000. *Allium cepa* (cytogenetic analysis of sprouts) and *Tradescantia poludosa* clone 02 (genetic mutation in staminal hairs) are used as test objects for bioindication of the mutagens. The rate of chromosomal aberrations in *Allium cepa* grown in the soil or silt in both regions, the rate of chromosomal aberrations in the cells of *Tradescantia poludosa* staminal hair, the principal quantitative cytogenetic indicators in peripheral blood lymphocytes in the population under study, and the frequency and percentage correlation of the principal types of chromosomal aberrations in peripheral blood lymphocytes are summarized. The findings attest to the global scale of contamination with mutagens and toxic substances in the entire region whereby mutation levels in test objects and aberration rates do not correlate with the pesticide usage of the degree of contamination. The conditions are characterized as critical. Tables 5; references 10: 7 Russian; 3 Western.

Use of Cosmid Bank of *Rhizobium Meliloti* Genes for Cloning Leucine Biosynthesis Gene Involved in Regulating Development of Nitrogen-Fixing Symbiosis With Alfalfa

947C0068B Moscow GENETIKA in Russian Vol 29 No 2, Feb 93 pp 235-245

[Article by A.A. Aronshtam, B.R. Umarov, V.N. Yerko, Ye.Ye. Andronov, B.V. Simarov, Agricultural Microbiology Institute, St. Petersburg; UDC 575:576.851.155]

[Abstract] The unique ability of glomal bacteria (*Rhizobia*) to bind atmospheric nitrogen in symbiosis with bean plants prompted an attempt to demonstrate the role *Rhizobium meliloti* leucine biosynthesis genes in the development of nitrogen-fixing symbiosis with alfalfa. To this end, the strains HB101 and S17.1 of *Escherichia coli* and the CXM 1 strain of *Rhizobium meliloti* as well as the pRK2013, pSUP2021, and pLAFR5 plasmids are used in the experiment. A leucine-auxotrophic mutant strain CXM1 which has lost its ability to form nitrogen-fixing symbiosis with alfalfa is produced by nonspecific transposonic mutagenesis using the pSUP2021 plasmid (Tn5) as the donor. The study shows that the addition of leucine directly to the plants inoculated with the auxotrophic mutant does not restore its ability to develop normal symbiosis. Large-scale screening of four types of alfalfa under sterile microvegetation conditions reveals the absence of interstrain variability and the existence of individual variability based on the behavior of host plant response to leucine auxotrophic inoculation. A bank of CXM1 strains is constructed on the basis of the cosmid pLAFR5 vector and used in conjugation cross-breeding for the purpose of complementing leucine auxotrophe. The findings also indicate that the leucine biosynthesis genes are involved in regulating the development of nitrogen-fixing symbiosis with alfalfa. The results lay the groundwork for a more detailed study of the relationship between the leucine biosynthesis and the expression of symbiotic properties in these bacteria. The authors are grateful to T.V. Ivashina and N.A. Provorov for assisting with the gene bank and making valuable remarks. Figures 5; tables 2; references 21: 3 Russian, 18 Western.

REC41: New Gene Involved in Regulating Recombination in *Saccharomyces Cerevisiae* Yeast

947C0068C Moscow GENETIKA in Russian Vol 29 No 2, Feb 93 pp 246-256

[Article by O.V. Chepurnaya, T.N. Kozhina, V.T. Peshekhonov, V.G. Korolev, St. Petersburg Nuclear Physics Institute imeni B.P. Konstantinov at Russia's Academy of Sciences, Gatchina; UDC 575:582.282]

[Abstract] The system for selecting rec⁻ yeast mutants based on taking into account the interplasmid recombination proposed earlier by the authors is examined further, and the findings of a study of one mutant which was produced with the help of this system and is characterized by a decreased interplasmid recombination frequency are presented. The rec41 mutant under study was produced from the 2D-3031 haploid strain. The study indicates that rec41-1 mutation lowers the efficiency of double-strand DNA break repairs due to the interplasmid and, possibly, interchromosomal and interchromatide recombination, leading to an elevated sensitivity of the mutant cells to ionizing radiation. An incomplete block of repair and recombination processes in rec41 mutant cells is probably due to the rec41-1 mutation phenotype. The REC41 gene was cloned in the pL3 multicopy vector. Integration mapping shows that the REC41 gene is located on the left arm of the VII chromosome, very close to the LYS5 gene. Plans for sequencing this gene and further investigating its genetic properties are outlined. Figures 2; tables 4; references 24: 6 Russian, 18 Western.

Allozyme Loci Mutagenesis of Induced by Ionizing Radiation in *Pinus Sylvestris L.* Megaspores Due to Chernobyl Nuclear Power Plant Accident

947C0068D Moscow GENETIKA in Russian
Vol 29 No 2, Feb 93 pp 266-273

[Article by V.A. Kalchenko, N.P. Arkhipov, I.S. Fedotov, General Genetics Institute imeni N.I. Vavilov at Russia's Academy of Sciences, Moscow, and Pripyat Scientific Production Association, Chernobyl; UDC 575:582.475.4]

[Abstract] The pressure exerted by man-caused environmental factors on natural ecosystems and the urgency of correlating the changes in the radiation conditions in the environment and the growth of the mutation burden in populations with their adaptation capabilities prompted a reexamination of the electrophoretic analysis of pine seed proteins *Pinus sylvestris L.* exposed to irradiation after the Chernobyl nuclear power plant accident in order to assess the genetic impact of the Chernobyl accident on the pine forest, set up radiation-environmental monitoring in the population relocation area's reforestation plantings at the molecular level, and ascertain the extent to which these data can be used to predict long-term genetic consequences on the nature's other creatures and humans. A list of enzymes with the number of their scored gene loci and commission code number, examples of abnormal heritability products of enzyme gene loci revealed by the electrophoresis study, the frequencies of various types of enzyme gene loci mutations induced by ionizing radiation in *Pinus sylvestris L.* macrospores after the accident, the genetic efficiency of radiation in the relocation area based on *Pinus sylvestris L.* data, and the rate of loci mutation which are encoding the enzyme synthesis in *Pinus sylvestris L.* endosperms in the relocation area are summarized, and the dependence of the viable seed yield and various types of mutations on the dosage rate is plotted. The findings confirm that the pine is a convenient test system which makes it possible to take into account the mutations induced at the hametic level, thus making a certain contribution to developing forecasts of long-term genetic consequences as they apply to other species where observation of mutations is complicated due to biological or ethical considerations. The authors are grateful to the Corresponding Member of the Academy Yu.P. Altukhov for valuable remarks. Figures 2; tables 4; references 21: 15 Russian, 6 Western.

Genetic Damage in Laboratory Mice Exposed in Chernobyl Nuclear Power Plant Area Four Years After Accident

947C0068E Moscow GENETIKA in Russian
Vol 29 No 2, Feb 93 pp 312-322

[Article by A.V. Chekhovich, M.D. Pomerantseva, L.K. Ramayya, V.A. Shevchenko, General Genetics Institute imeni N.I. Vavilov at Russia's Academy of Sciences, Moscow; UDC 575.224.23.3.46:599.323]

[Abstract] Earlier mammal studies aimed at evaluating the genetic consequences of the elevated radiation background in the Chernobyl nuclear power plant area are continued, and the genetic variations in mice exposed in 1989 to 14-, 22-, and 34-day irradiation within the 10-km Chernobyl nuclear power plant zone are examined; an attempt is made to investigate the dependence of the genetic effect in sex cells on the exposure duration, animal hemotype, and the ontogenesis stage affected by the exposure. To this end, (CBAxC57BL)F_1 hybrid mice of both sexes and sexually mature C57BL males in wire mesh cages are studied at a surface dose (measured by a DP-5 radiation monitor) averaging 60 mR/h. In addition, DTG-4 and MKDT radiation monitors were used for determining the absorbed γ-radiation dose and the cumulative absorbed γ- and β-radiation. The genetic effect of radiation on the sex cell was evaluated by the dominant lethal mutation (DLM) rate characterized by the embryo mortality before and after implantation; by the frequency of abnormal spermia heads (AGS), and by the rate of reciprocal translocations (RT) induced at the diakinesis stage. The study reveals a linear dependence of the induced effect on the absorbed dose magnitude. Among the animals irradiated during the embryonic development period, a male who is heterozygotic with respect to the reciprocal translocation is identified. No unambiguous relationship between the genetic effect and mice genotype was revealed. The findings can be used for quantitative estimates of the genetic danger from radiation for humans. The authors are grateful to V.S. Lysenkova, G.A. Vilkina, K.N. Yarovoy, and A.I. Shaks for assistance. Figures 4; tables 4; references 7.

Immunoregulatory Properties of Recombinant Human Antigen

937C0406D Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 115 No 5, May 93 (manuscript received 8 Dec 92) pp 510-512

[Article by L.S. Yeliseyeva and N.P. Mertvetsov, Physiology Institute, Siberian Department, Russian Academy of Medical Sciences, and Bioorganic Chemistry Institute, Siberian Department, Russian Academy of Sciences, Novosibirsk; UDC 612.017.014:46:615.37]

[Abstract] A study examined the immunoregulatory effects of human recombinant angiogenin (produced in Russia) in a total of 197 CBA mice aged 3 to 4.5 months. Three tests were conducted to evaluate antigen-induced immune system activation. Each of the tests performed was conducted on a group of at least 7 mice. In a study of the rossette formation process, the mice were given intraperitoneal [IP] injections of either ram erythrocytes or ram erythrocytes + angiogenin per mouse. Delayed-type hypersensitivity was used to test another type of cellular reaction. During that test, mice were given IP injections of ram erythrocytes or ram erythrocytes + angiogenin and then reinjected in with a higher dose 4 days later. The extent of edema was evaluated 24, 48, and 72 hours thereafter. The hemagglutinin level was used to test mice's humoral response to the injections 4, 8, 11, and 14 days after primary immunization and 3-4 days after secondary immunization. The results were subjected to statistical processing with Student's *t*-test. The analysis of rossette-forming cells based on the number of ram erythrocytes absorbed demonstrated that it is not a very sensitive indicator with respect to angiogenin effect: Only in isolated cases was an angiogenin-induced shift toward predominance of rossette-forming cells with a high (>3 ram erythrocytes) antigen-binding activity detected. The development of delayed-type hypersensitivity was demonstrated to be affected by angiogenin: In mice receiving a sensitizing dose of antigen in the presence of angiogenin, the reaction was inhibited 24 and 48 hours after repeated injection of the antigen, and the amount of edema in the said mice was markedly lower than in the mice that did not receive the preparation. Study of the course of the humoral reaction revealed that it is not very sensitive to angiogenin even when used in the optimum dose. Figures 4; references 10: 4 Russian, 6 Western.

Cerebral Paralysis Treatment

937C0368 Moscow IZOBRETATEL I RATSIONALIZATOR in Russian No 6, Jun 93 pp 26-27, 31

[Article by M. Karlov, under the rubric "They've Gotten Into It!": "Paralysis: An Investigation of Moral Suicide"; first three paragraphs are source introduction]

[Text] *"In the issues that follow, we intend to restore the column "Protection of the Rights of Inventors," and new ones will appear, too—such as "They've Gotten Into It!" In the latter we will print various of people's stories whose heroes turn out to be, one way or other, inventors who have been duped and swindled by new 'commercial' structures. Write to us about it, but be honest, as if you were making an official statement, and don't forget to attach copies of documents." That appeal to readers was published in the "Editor's Column" (IZOBRETATEL I RATSIONALIZATOR, No 1, 1993, back page of cover).*

We are keeping our promise. After an inventor told us everything he could, as if in an official statement, he brought to our editorial offices all the documents—right down to the court decisions—that pose one of the timely questions of our lives today: do we always have to immediately pounce on the proposals of new commercial structures that appear to be beneficial? The morals of our market are still rather wild.

Before the pain, there is the familiar collision: a Moscow physician proposed a new technique—a drug-free treatment of certain forms of infantile cerebral paralysis, but health care agencies holds it back for 20 some-odd years. Despairing, the physician agrees to the intervention of a commercial firm. And as a result, the name of the real author of the technique doesn't appear in the patent application. Now a tandem—capital plus intellectual property—has become widespread. But often businessmen simply steal from the innovator. How does that happen?

Physician V. Tychina arrived at the idea that at the core of the development of infantile cerebral paralysis, just as with epilepsy, lies overvoltage in individual structures (so-called neural units) in the brain of the child. An excess of neural impulses leads to involuntary, convulsive contractions of muscles, which causes anomalous poses and movements. That means you have to eliminate the overvoltage in the brain, "turn off" the damaged areas, and "turn on" structures of the central nervous system that were not working before. That can be done, the physician decided, by using something well-known to all medical people—feedback: if an impulse from the brain causes contraction of the muscles, then purposely contracted muscles send the necessary signal back to the brain.

Based on experience he had garnered over several years as Cand. Med. Sci. Tychina at the Institute of Biomedical Problems (simply put, space medicine) and the Manned Flight Control Center, a technique with a long name was brought to life by the now pediatric neuropathologist: "functional, dynamic, instantaneous correction of the pathologically changed pose of the body and the extremities, with subsequent adaptive biocontrol." Tychina decided to make use of the Penguin—the anti-g suit of the cosmonauts that simulates the earth's gravity. In it, special stays makes it possible to cause, in a programmed fashion, the necessary muscle contractions. You have the feedback mentioned above: between the muscles and the brain. The suit, of course, which is designed for an perfectly healthy grown person, is no good in many ways for a sick child. So Tychina, after getting his hands on one Penguin, modified it to suit his medical ideas. Here are the results of clinical tests from nearly 15 years of observation. If the treatment result of the current techniques for treating infantile cerebral paralysis is no more than a 1-2 percent success rate, the result with the use of the suit is 15-30 percent. And if the Penguin is used in very beginning of the illness, then success comes in nearly half the cases. On average, a course of treatment takes two weeks. Note that the Ministry of Health didn't move a finger to help the inventor for 15 years.

Then a paralysis of a completely nonmedical nature lay in wait for the progressive technique. For nine months (very symbolic, it must be said) Tychina tried to convince his boss, Prof. K. Semenova, to allow the experiment. Finally, he got the go-ahead. The director of the Institute of Biomedical Problems, Prof. A. Grigoryev, helped get one Penguin to [illegible] Zvezda [Star]. The experiments were performed in the children's psychoneurological hospital No. 18. The results given above were recorded in a report that was verified by the head of the Department of Pediatric Neurology of the Central Institute of Postgraduate Medicine, Prof. Ye. Bondarenko.

That took place in September 1991. But as early as April, Prof. K. Semenova and Cand. Med. Sci. V. Tychina, on the one hand, and representatives of the Zvezda firm Prof. A. Barer, Cand. Med. Sci. Ye. Tikhomirov, and Prof. I. Kozlovskaya (Institute of Biomedical Problems), on the other, had agreed to patent the technique. And that is exactly where the seed of the conflict lies, in my opinion. Tychina is a physician and an inventor. But also a person who has no idea of the fine points of patent affairs. A person used to believing another's word: they agreed, and that means they agreed. And he prepared all the initial documents for the application. In August of that year, another version of the patent was discussed (note that all the versions were produced by Tychina; the other side merely listened). At the suggestion of the Zvezda representatives, the term "Penguin" was removed from the patent. A stereotypical thing apparently triggered that: everything from the space sector is "Secret!"

The work continued. But, as explained earlier, the position of the partners turned out to be not entirely partnerlike. Everything that Zvezda did remained secret from the co-authors of the application.

We live in an interesting time. The age-old division of labor—that each does his own work: he treats, invents, serves, advances science, or trades—is now topsy-turvy. Everybody is caught by the incessant passion: How can I make money? And here's the loophole that's been found—on your good fortune. The moral brakes—and in our case, ordinary common sense—are failing. In the fractured, wild market of Russia, the law of "Whatever makes a profit" reigns.

And so Tychina accidentally finds out that a small enterprise has been set up at Zvezda to commercialize the technique. Without the consent of the man who invented the technique, of course. And the application has a whole throng of authors. And besides that, Zvezda has already made "legal" contact with a millionaire from Austria, a Mr. Badian, who has announced his readiness to finance and advertize the entire program and assume the international patent. And to cover themselves—after all, he's a foreigner—they find a millionaire from a nearby foreign country, in Baku. He knows that the deal is good and that V. Tychina had cured his nephew.

What's wrong with this picture? Momentary gain fogged the minds of the businessmen. The author was beginning to get in their way. True enough, he's not rocking the law, he's not running from office to office. He just wants some human fairness. But in a world where "Whatever makes a profit" reigns, that's not the custom. It's finders-keepers. Here's what V. Tychina says about one of his "coauthors": "In May 1991, at the Science Council of the All-Union Science Center for Safeguarding the Health of Mother and Child, Prof. K. Semenova was reporting on the techniques for treating infantile cerebral paralysis and was showing slide she got from me. She hadn't told me ahead of time that she would be giving the report or that she would be showing my slide materials—and I walked into the hall just by accident. And that was after we had agreed to keep it confidential until the patent application was published. Later, Prof. Semenova was part of a science delegation in Poland, where she gave the same report and showed those same slides of mine. And without mentioning my name. I was told that by people who had gone on the trip."

The Zvezda firm continued to raise capital to commercialize the technique. It found another millionaire, from Moscow (as I study this detective-like novel, I can't help but think millionaires are gradually become more numerous than physician-inventors). The firm arranged an event, and its representative brought Tychina an application drawn up and signed by the "coauthors" for immediate submission to NIIGPE [not further expanded]. An amazing document! The idea, its development, and the modification of the Penguin all belonged to Tychina; the firm merely provided the suit and edited the texts of the application. But of the 11 (!) coauthors, nine are Zvezda staff members.

For the first time, Tychina "freaked out." And he submitted his own application (priority No. 5006401/14, 14 November 1991), with K. Semenova and N. Yumanov as coauthors. But Prof. Semenova preferred working with Zvezda. That was the last straw. V. Tychina left the institute in January of last year. He didn't go anywhere else. His wife supported him and the family for a while.

And then a ray of light, albeit with some threatening peals of thunder. The inventor was heartened by a meeting with the president of the Ayurveda joint stock company, Ye. Firer, that same Moscow millionaire mentioned earlier. He suggested a collaboration, but in a somewhat strange form.

"I got two choices," says Tychina. "The first was to go back to the beginning: collaboration with Zvezda. The second was to have a judicial process initiated against me in order to argue the authorship of the technique in favor of professors Semenova and Kozlovskaya. Ayurveda has the attorneys, lawyers, and money for that. I chose the first. I liked the idea of working virtually independently, at the head of a group, with a powerful base and materials for manufacturing the suits. Not the final argument was the complete hopelessness I had experienced over that period. While I was working at Ayurveda, I performed more than 20 assignments at the children's psychoneurological hospital No. 18. Among the physicians there, as a neuropathologist familiar with infantile cerebral paralysis, I was alone. The others were psychiatrists, logopedists, and specialists in exercise therapy. I taught them the techniques and methods of working with the Penguin. Everybody did a lot of work. And they were successful—the tests yielded excellent clinical results. After things got going so well, I suggested to Ye. Firer a plan for creating a Center for Rehabilitation of infantile cerebral paralysis patients. At his request, I supplied him with documents, and he suggested that in June or July 1992 I go to Poland, where, at a branch of the firm, I would set up a Center and introduce my technique. But I never went anywhere..."

The gradual suppression of the inventor continued. Ye. Firer asked Tychina to call his application back from NIIGPE to improve and refine it. But just as the inventor was thinking about doing it, Prof. Semenova, using the rights of coauthorship, did it herself.

By the way, attorney N. Bazarova, after becoming familiar with the contracts of the participants of the clinical group, the licensing agreements, and the other agreements—i.e., the documents drawn up in Ayurveda—characterized them succinctly as stealing. Tychina writes an official statement to Firer in which he refuses to transfer the know-how to the firm. No reply.

But the idea for the Center, Tychina continues to push. He writes a letter to the then-vice premier of Russia, B. Saltykov, enclosing positive responses from the most prominent medical people in the country—Russian Academy of Medical Sciences Academician A. Chuchalin, for example, and Corresponding Member A. Baranov. Later, at a meeting of the Academy of Medical Sciences (January 1993), Russian Academy of Medical

Sciences Academician L. Badalyan, a world renowned scientist and neuropathologist, says this: "The documents, problems, and conclusions of V. Tychina confirm the need for the Center. The field of activity is such that there's plenty for everyone. There is convincing data. Vladimir Pavlovich, your priorities can be maintained, you can do your job. That's what we will write in reply to the Government."

But that's the opinion of the medical people. Who listens to them? And in the next application, NIIGPE section chief I. Lebedev refused to insert Tychina's name, saying that he could be made a "coauthor" only in court. Ye. Firer seemingly supports the inventor. The question of a new application comes up, in order to "isolate" the Zvezda firm—there had started to be friction between him and the firm. He is outraged over the draft of the licensing agreement that came from the firm: they are requiring 33 percent of the income and dividends. But the indignation, as the near future will show, doesn't last long. After all, money bags look after their own interests only, interests that often don't coincide with those of inventors or society.

On 23 June 1992, the Frunza People's Court of Moscow, after sorting out the materials of the case, ruled in favor of inserting the name of V. Tychina into the list of coauthors. On 16 July of that same year, the decision of the court was sent to NIIGPE.

Tychina explains: "All of June and July I was running around doing things concerning the Center. They don't give me my wages at Ayurveda—and again I'm without any money. I can't catch Firer in his office. Finally, in the last few days of July, he shows up saying that a new licensing agreement has to be signed. When I looked it over, I saw that the benefit to me consisted in my signing over all my rights to the invention for 10,000 rubles [R]. I said that the main thing in this work was the intellectual labor involved. Firer answered that it's a finished product that's paid for, and that intellectual labor has no right to that. Then I said that you can't put the cart before the horse, that I couldn't sign an agreement before there's even a patent. Since then, all personal contact with Firer has ceased..."

Tychina left Ayurveda; he continues to work at hospital No. 18. But since there is an agreement which says that Zvezda can provide the Penguin suits for medical purposes through Ayurveda only, the only specialist in the field is virtually blocked of any possibility of helping sick children.

The moral breakdown continues. Despite the court decision, the inventor's name is still not on the application. The question of the Center is hanging in the air, and most important of all, the inventor is absent from work involving improvement of the technique. Narrow-mindedness has paralyzed the creative process.

The matter has come to a halt, and the paperwork is burgeoning. Sometimes it's phenomenal in its disingenuousness. Here's a document signed by the president of the Russian Academy of Medical Sciences, V. Pokrovskiy, and sent to the government (No. 11-18/12, dated 25 January 1991): "The device and the technique (*medical use of the Penguin suit is what is referred to here—Ed.*) have been patented in Russia and, at present, are in the process of receiving an international patent. To preserve the possibility of international patenting and thereby the influx of currency from various countries to ensure that the children of Russia get free treatment, confidentiality must be observed. When the international patenting process is completed, the technique can be used via license or free for the low-income strata of the populace. At present, there are in Moscow a sufficient number of institutions involved with infantile cerebral paralysis in which the Penguin anti-g suit could be used as one of the techniques in an integrated therapy for infantile cerebral paralysis. In connection with what has been said, the opening of a new medical and social center is not necessary. V. Tychina is in agreement with that conclusion."

It's hard to say who prepared that letter. Every phrase in it is, to put it mildly, an inaccuracy. International patenting is being done without his authorization or consent. The confidentiality about which the president of the Academy of Medical Sciences warns has been violated over and over by Prof. Semenova. The Penguin suit has to be modified for clinical work, which is what the inventor has done and is doing. The city hospital No. 18 and the other treatment facilities are incapable of meeting the aims of a Humanitarian Center for the entire state. And of course, V. Tychina is not in agreement with the conclusion.

Against the backdrop of all the phantasmagoria that the inventor has gone through, one proposal stands out from faraway Chita. A science consultant for the foreign-economic firm Kompleks, Dr. Med. Sci. S. Dzasokhov, says this: "I've become very familiar with the work of Dr. Tychina. I consider it very interesting and original and extremely timely. We're ready to help him implement the technique. But it's Tychina's technique, not one in the clutches of the "coauthors." Our firm has collaborated very fruitfully with Chinese entrepreneurs who know of the technique from us. And they're ready to help in every way possible."

It would seem that common sense and morality aren't weathering well in Russia. We will overcome the paralysis that has fettered Tychina's creative potential. True enough, the sides are unequal right now. Just an "ordinary" candidate of medical sciences and inventor on one side, and professors and, mainly, rich businessmen with a staff of attorneys on the other. Plus millionaires from abroad, near and far. I have almost no doubt that they will set up production of Penguins for medical purposes and will outfit clinics with them. But it will be in the customary manner: first abroad, and only then in Russia, and for hard currency. It's such a shame - - the only person who knows the technique backwards and forwards and knows how to use it, because he's the one who invented it, has been totally removed from the picture. Through the efforts of his opponents—"coauthors"—he has been declared a caviller. Everything has been taken away from him—the idea, the development of the technique, the treatment results, even the instruments for performing individual fragments of the work. It's hard to imagine how much harm can be done to severely ill children by the moneybags that fall greedily upon a plump commercial morsel.

Honestly, I will be happy if Tychina concludes a contract with Chinese specialists. They say they will observe the terms such contracts. And we'll treat Russian children in Chinese Penguins.

Oxidation of Molecular Hydrogen and Carbon Monoxide by Facultative Chemolithotrophic Vanadate-reducing Bacteria

937C0334a Moscow MIKROBIOLOGIYA in Russian Vol 62 No 4, Jul-Aug 93 [Manuscript received 27 Nov 90] pp 597-603

[Article by N. A. Yukova, N. D. Saveleva, and N. N. Lyalikova, Institute of Microbiology, Russian Academy of Sciences, Moscow; UDC 579.8.017.7:577.152.1

[Abstract] Further studies on the recently discovered bacteria Pseudomonas vanadiumreductans and P. isachenkovii are reported. These organisms accomplish anaerobic reduction of pentavalent vanadium with concomitant oxidation of hydrogen or carbon monoxide. Cultures of these microbes were found to grow best in an atmosphere of hydrogen and oxygen, with slower growth in carbon monoxide plus oxygen. Under anaerobic conditions with vanadate, the organisms grew faster in hydrogen than in carbon monoxide. No period of adaptation was seen when going from aerobic to anaerobic conditions or vice versa. P. vanadiumreductans grew somewhat faster than P. isachenkovii under all conditions. The observations were confirmed using autotrophic assimilation of $^{14}_{2}$. In the presence of both nitrate and vanadate, the microbes reduced nitrate first. The results indicate that the bacteria accomplish a new energetic process involving anaerobic respiration with oxidation of hydrogen or carbon monoxide accompanied by reduction of vanadate. The development of chemical methods for precipitating the vanadium colloids formed by these bacteria would make it possible to use them in the purification of industrial waste water. Figures 4; references 6: 3 Russian, 3 Western.

Development of a Method of Producing Plague Microbe Adhesion Pili (Lectins)

937C0430C Moscow BIOTEKHNOLOGIYA in Russian No 4, Jul-Aug 92 (manuscript received 5 Mar 92) pp 18-21

[Article by S.O. Vodopyanov, B.N. Mishankin, I.P. Oleynikov, T.D. Yermolenko, and O.I. Salnikova, Antiplague Scientific Research Institute, Rostov-na-Donu; UDC 579.842.23:577.112]

[Abstract] A quick and simple process has been developed for producing a homogeneous preparation of native adhesion pili (lectin) of plague microbe. The plague strain *Yersinia pestis* Otten minus the plasmids pYV and pYT and not forming antigen fraction 1 or V-W antigens at this bond was used as an adhesion pili producer. The bacterial cells were cultured for 48 hours at 37° on Agar L, after which the cells were rinsed, brought to a concentration of 50 billion/ml, treated in a homogenizer, and centrifuged to produce a supernatant representing a coarse adhesion pili preparation that was then degreased by adding chloroform to a volume of 1 percent. The preparation was reprecipitated three times with ammonium sulfate (pH 7.2) in the 15-25 percent saturation range. After 2 hours of incubation at room temperature, the precipitate was collected by centrifugation and dissolved in the starting volume of physiological solution overnight at 4° with continuous stirring. When necessary, the resultant solution was lightened by filtration through Whatman 1 paper, and the ammonium sulfate residue was removed by dialysis. The purity and nativity of the resultant preparations was tested by disk electrophoresis in 7.5 percent polyacrylamide gel and 10 percent gel with 0.1 percent sodium dodecyl sulfate [SDS-PAGE]. The SDS-PAGE and a test of the precipitates' reactivity with commercial plague agglutinating sera established that the resultant preparation of adhesion pili was characterized by high nativity and homogeneity. The adhesion pili preparation also had a pronounced mannose-resistant hemagglutinating activity, it induced leukoagglutination and blast transformation of T and B leukocytes, and had a strong cytotoxic effect on mixed HeLa, Vero, L-929, and CHO cells cultured in Eagle's medium and the medium 199 in a 1:1 ratio with 10 percent fetal calf serum. The new process for isolating adhesion pili may be used to obtain quantities suitable for producing preparations. Figures 2, tables 3; references 16: 9 Russian, 7 Western.

Study of the Spontaneous Phage Production of *Pseudomonas pseudomallei* and the Range of Hosts of Melioidosis Phages Among Representatives of the Genus *Pseudomonas*

937C0414C Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 55 No 4, Sep-Oct 93 (manuscript received 1 Apr 92) pp 43-47

[Article by T.A. Grishkina and L.G. Merinova, Volgograd Antiplague Scientific Research Institute; UDC 576.8.097.35:576.851.132]

[Abstract] The spontaneous phage production capability of the museum specimen *Pseudomonas pseudomallei* was examined, its effectiveness was evaluated, and the range of hosts of melioidosis phages among representatives of the genus *Pseudomonas* was determined. The studies were performed on 57 museum strains of *P. pseudomallei*, 14 strains of *P. mallei*, and 11 strains of *P. cepacia*, as well as on the strains *P. aeruginosa* 4000, *P. alcaligenes* 1300, *P. stutzeri* 4136, *P. maltophilia* 4131, *P. fluorescens* 896, and *P. paucimobillis* 4177. The bacteria were cultured in 1.5 and 0.7 percent N-agar (Difco) with 5 percent glycerin and N-broth (Difco). The bilayer method was used to determine phage production in an indicator culture of *P. mallei* Z 12. Most of the strains studied proved capable of spontaneously producing phages with a frequency of 10^7 to 1. *P. pseudomallei* 108 and 116 were found to have the lowest frequency (10^7), and *P. pseudomallei* 97 was found to have the highest frequency. Negative colonies of various morphology (transparent, turbid, and turbid with secondary growth in the center) formed on the indicator lawn of *P. mallei*. No clear correlation was found between the frequency of spontaneous phage production and the morphology of the negative colonies. The range of melioidosis phage

hosts existing among 88 representatives of the genus *Pseudomonas* was determined. Sixty-six were found to be sensitive to at least one lysate. Overall, the *P. pseudomallei* strains proved more sensitive to the melioidosis strains than the *P. mallei* did. The glanderous strains were sensitive to an average of 33 phagolysates; the melioidosis strains were only sensitive to an average of 14.2. All of the melioidosis strains were found to be resistant to their own phages. No phages (not even those with a quantitative coincidence of sensitive strains) were found to be identical from the standpoint of lytic effect. Maximum activity was discovered in eight lysates that lysed between 42 and 53 of the 88 strains studied. Six of the lysates found to manifest maximum activity were obtained from strains that were not sensitive to even one phage. Six lysates were discovered to exhibit minimum activity; they lysed from 10 to 16 strains each. Tables 2; references 7: 4 Russian, 3 Western.

Composition of the Fatty Acids of Plague Microbe Cell Structures

937C0414B Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 55 No 4, Sep-Oct 93 (manuscript received 3 Jul 92) pp 16-20

[Article by V.M. Samygin, L.F. Zykin, V.M. Stepanov, A.A. Stepin, and I.I. Korsakova, Volgograd Antiplague Scientific Research Institute, and Central Asia Antiplague Scientific Research Institute, Alma-Ata; UDC 616.981.452:576.851.45:577.1]

[Abstract] The composition of the fatty acids of cytoplasmic membrane lipids and lipopolysaccharides of virulent and vaccine strains of plague microbe were studied. Plague microbe cultures were incubated at 28°C for 48 hours. The strain YeV (from the NIIEG [as published]) and two variations of the strain, as well as seven virulent cultures from the Taukum natural focus and two museum strains, were used in the lipopolysaccharide studies. One vaccine and two virulent strains were used in the cytoplasmic membrane studies. The lipopolysaccharides were isolated from acetone-dried cells by water-phenol extraction, and the cytoplasmic membrane was isolated from autoclaved washed cells by differential centrifugation. The fatty acids were studied in the form of methyl ethers by gas-liquid chromatography. The lipopolysaccharides of the vaccine and virulent strains were found to have qualitatively identical fatty acid compositions, including unsaturated (laurinic, myristic, and palmitic acid), monoene (palmitolic, oleic, and elaidic acid), 3-oxymyristic, and two unidentified (X_1 and X_2) acids. Careful analysis of the quantitative ratios of the individual acids revealed several features that made it possible to tentatively classify all the strains into three groups. The group 1 strains were characterized by a high content of 3-oxymyristic acid. The group 2 strains were distinguished by their high concentration of laurinic acid. The differences between the two groups of virulent cultures were related neither to territorial distribution of the strains within the confines of the area of their natural focus nor to the object from which they were isolated. The fresh strains were more stable than the museum cultures, however. The studies of the cytoplasmic membranes established that the spectrum of their fatty acids largely coincided with that of the lipopolysaccharide lipids; however, the cytoplasmic membranes contained pentadecanoic acid, which was absent in the lipopolysaccharides. The presence and ratio of certain acids in the virulent strains differed from that in the vaccine strains. This was especially true in the case of laurinic acid and two unidentified components (termed H_1 and H_2). The concentrations of palmitolic and methylenehexadecanoic acid present in the vaccine strains were lower than those in the virulent strains. Figures 2, tables 2; references 10: 9 Russian, 1 Western.

Participation of Plague Microbe Neuraminidase in Transmission of Transmembrane Signal

937C0414D Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 55 No 4, Sep-Oct 93 (manuscript received 24 Oct 91) pp 59-63

[Article by L.Ye. Aseyeva, B.N. Mishankin, N.Ya. Shimanyuk, B.D. Rublev, and S.O. Vodopyanov, Rostovna-Donu Antiplague Scientific Research Institute; UDC [579.842.23:577.15]:[591.111.1.612(018)6]]

[Abstract] A study examined the possible participation of plague microbe neuraminidase in the transmission of a transmembrane signal based on the model of white mouse peritoneal leukocytes. Neuraminidase was isolated from cells of the strain *Yersinia pestis* Otten 556/106 and purified as described elsewhere. N-acetylglycoproteid of neuraminic acid from a ram's submaxillary gland was used as a substrate. The enzyme preparation used had a specific activity of 1,184 neuraminidase units/mg. Peritoneal leukocytes were obtained from nonpedigree white mice by the standard method. The leukocytes' functional state was evaluated by using a suspension of cells of the strain *E. coli* QD 5003 (pro^-, and 1.091-μm-diameter polystyrene (latex) particles (0.75-1.0 x 10^8 per sample) were used as a nonspecific indicator of chemiluminescence. By modifying the oligosaccharides of cytoplasmic membrane with different concentrations (10^{-10} to 10^{-7} g/ml) of neuraminidase, researchers were able to obtain chemiluminescence profiles of the white mouse peritoneal leukocytes. During the first minutes of the cells' contact with low doses of neuraminidase, their chemiluminescence increased only slightly (104-112 percent). Only a dose of 10^{-5} g/ml of enzyme caused a significant increase in luminescence. The chemiluminescence level proved to be unstable, however, and over the next 10 minutes it decreased to 63-53 percent of its starting level. The addition of colibacillus or latex to the specimens to evaluate the functional capability of the enzyme-pretreated leukocytes of the QD 5062 cell suspension resulted in a sharp activation (up to 153-234 percent) of chemiluminescence followed by a subsequent decline in chemiluminescence to 43-82 percent. When the leukocytes were treated with a large dose of enzyme (10^{-5} g/ml), the degree of expression of the subsequent events intensified: the leukocytes' luminescence reached 234 percent of its starting level, and the addition of colibacillus caused an additional

chemiluminescence flare-up that reached 582 percent after 1 minute and then decreased to 279 percent after 10 minutes. The effect of neuraminidase on the white mouse leukocytes proved to be dose dependent, and it suppressed the insulin-activated transport of the carbohydrate 1-^{14}C-galactose. The priming of leukocytes by neuraminidase was accompanied by a sharp increase in hydrogen peroxide production under the effect of plague microbe capsule antigen, evidently as a result of the appearance of additional binding sites for the adhesion pili of plague causal agent. It was hypothesized that treating the peritoneal leukocytes of white mice with plague microbe neuraminidase results in a partial loss of the signal-transporting system in plasma membranes in the stages preceding specific binding of galactose with insulin receptor. Figures 2, tables 2; references 11: 6 Russian, 5 Western.

Effect of Plague Virus Fraction 1 Protein-Polysaccharide Complex and Pure Protein on Macrophage Metabolic Indicators

937C0406C Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 115 No 5, May 93 (manuscript received 15 Jan 93) pp 494-496

[Article by G.B. Kirillicheva, A.V. Naumov, M.Yu. Ledvanov, N.Yu. Stukova, I.G. Baturina, T.M. Taranwnko, L.N. Serdobintsev, and O.P. Plotnikov, Epidemiology and Microbiology Scientific Research Institute imeni N.F. Gamaley, Russian Academy of Sciences, Moscow, and Mikrob NIPChI [as published], Saratov; UDC 615.372:[579.842.23:579.222:547.96].015.4 :612.112.95]

[Abstract] A study compared the effects that the fraction 1 polysaccharide-protein complex of *Yersinia pestis* and its purified protein have on those metabolic indicators of macrophages of peritoneal exudate that characterize the cells' functional activity (i.e., chemiluminescence response and activity of ecto-5'-nucleotidase). The experiments were performed on hybrid male mice (CBA x C57B1/6)F_1 weighing 16-18 g each. The protein-polysaccharide complex and pure protein of fraction 1 were injected into the mice subcutaneously in doses of 2 and 100 μg. The activity of 5'-nucleotidase in the peritoneal exudate macrophage was determined 1 and 7 days after the injections. Both the chemiluminescence response and the activity of ecto-5'-nucleotidase were found to depend on the dose of fraction 1 and the time until examination. No changes in 5'-nucleotidase activity were observed 1 day after injection of the pure protein fraction. Only after 7 days was a decrease in enzyme activity observed. This decrease was somewhat more pronounced when a lower dose was administered. The changes in chemiluminescence response were more significant. An intensification of induced chemiluminescence was observed for both doses of pure protein used. On day 7 after injection, a sharp increase in chemiluminescence was observed in the mice into which pure protein fraction had been injected in a dose of 90 μg. The change in 5'-nucleotidase activity was the same in response to both doses of pure protein fraction: There was no change in 5'-nucleotidase activity on day 1, but there was a decrease on day 7. The chemiluminescence response different greatly depending on the dose used, however. When pure protein was injected in a dose of 1 μg, the increase in chemiluminescence peaked on day 1. In doses of 90 μg, on the other hand, there was a slight increase in chemiluminescence response on day 1 followed by a sharp increase on day 7. When the protein-polysaccharide complex of fraction 1 was injected, the change in 5'-nucleotidase activity observed on day 1 after injection was more pronounced. The change on day 7 was not more pronounced, however. Doses of 2 μg of protein-polysaccharide complex resulted in an increase in enzyme activity on day 1 followed by a decrease on day 7. In doses of 90 μg, on the other hand, a decrease on day 1 and slight increase on day 7 were observed. The high immunologic activity associated with the use of fraction 1 containing a polysaccharide component possessing a nonspecific effect on the body was interpreted as yet another piece of evidence in favor of the hypothesis that not only specific but also nonspecific factors play an important role in the development of nonreceptivity to plague. Figures 2; references 8 (Russian).

In Vivo and *in Vitro* Study of Plasmid Fragments of Ca^{2+}-Dependence of *Yersinia Pestis* (Lehmann, Neumann)

947C0068A Moscow GENETIKA in Russian Vol 29 No 2, Feb 93 pp 225-234

[Article by O.T. Mozharov, Ye.P. Savostina, P.I. Anisimov, G.P. Shvedun, I.N. Yezhov, I.V. Tuchkov, T.I. Shiryayeva, All-Russian Mikrob Antiplague Scientific Research Institute, Saratov; UDC 576.8:575 :616.981.452]

[Abstract] The discovery that the Ca^{2+}-dependence plasmid is the necessary inversion genome element for imparting virulence prompted a study in which biologically active pCaD loci were cloned and their functions subsequently examined. In particular, the fifth HindIII fragment of PCaD and hybrid plasmids containing small functionally significant segments of this fragment are investigated. Altogether, a bank of HindIII, EcoRI, and PstI fragments of the Ca^{2+}-dependence plasmid of *Yersinia pestis*, strain 358, is constructed, and restriction pCaD charts are plotted by means of restriction analysis using these fragments as probes. The findings demonstrate that the study of the mutation versions' expression of an intact pCaD plasmid or even its small fragments is probably not justified in some cases due to the complicated and little-known regulatory relationships among this plasmid's individual genes. An animal study also reveals that two subfragments of the fifth HindIII fragment are capable of ensuring the pathogenic and invasiveness properties of avirulent strains of *Y. pestis*, *Y. pseudotuberculosis*, and *E. coli* while the full nucleotide sequence does not exhibit such properties. The issue of the reasons for the absence of protective effect from immunization with *E. coli* strains pSM2' and pSM3' remains unclear. Figures 5; tables 2; references 36: 10 Russian, 26 Western.

Changes in the Pharmacokinetics and Pharmacodynamics of Drugs in Response to Different Ranges of Microwaves

947C0035A Moscow VOPROSY KURORTOLOGII, FIZIOTERAPII I LECHEBNOY FIZICHESKOY KULTURY in Russian No 4, Jul-Aug 93 pp 1-6

[Article by V.S. Ulashchik, Minsk Medical Institute; UDC 615.2/.3.015.2:615.849.112].015.4.07]

[Abstract] A series of human and animal experiments were conducted to compare the effects of different ranges of microwaves on the pharmacokinetics and pharmacodynamics of selected drugs belonging to different pharmacotherapeutic groups, including novocain, morphine, heparin, metapyrin, and streptocide. Doses commonly accepted in pharmacotherapy were used in the human studies, and doses calculated with consideration for species sensitivity were used with rabbits. The microwave irradiation was performed by the contact method with series-produced therapeutic devices (the SMV-20, Luch-3, DMV-20 Ranet, and Yav-1) at flux densities of 50 to 200 mW/cm^2 for 10 minutes in most of the experiments. Spectral, chmromatographic, and radiometric studies were used to determine the drug concentrations. The studies performed with novocain and streptocide established that decimetric-range microwave irradiation at a power-flow density of 100 mW/cm^2 significantly alter the entry and accumulation in the skin of drugs that have been injected intraperitoneally into study subjects: Low doses of microwave radiation (50 mW/cm^2) not only intensified the drugs' entry, but also facilitated their deposition in the skin. Irradiation at a power-flow density of 100 mW/cm^2 later (after 6 hours) resulted in accelerated reabsorption of the drugs from the skin. As the power-flow density of the microwave radiation was increased from 2 to 10 W, the concentration of the drugs in the tissues increased more significantly; however, their reabsorption from the skin also occurred more rapidly. This faster accumulation and reabsorption in and from the skin was attributed to the microwave radiation's effect on the regional blood circulation and microcirculation, penetration of the histohematic barriers, and binding of the drugs by proteins. Additional experiments examining the effects of anesthetics (metapyrin, novocain, and morphine) and drugs affecting the blood's coagulation (heparin and calcium chloride) established that microwaves not only affect the blood's coagulation, but also modify the effect of coagulants and anticoagulants depending on the type and intensity of irradiation. The hypocoagulation effect and potentiation of heparin's effect peaked at a power-flow density of 100 mW/cm^2. Higher doses of microwaves (200 mW/cm^2) potentiated the effect of the coagulants. Microwave radiation was also demonstrated to prolong the effect of the said drugs: The hypocoagulation effect of heparin injected against a background of decimetric-range microwave radiation at power-flow densities of 50 and 100 mW/cm^2 increased up to 8 and 12 hours, respectively (versus 4-6 hours in the controls). Similar results were achieved in the studies performed with analgesics. Figures 2, tables 3; references 20: 17 Russian, 3 Western.

Assessment of Fungus Resistance of Microassemblies

947C0012A St. Petersburg MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 27 No 4, Jul-Aug 93 (manuscript received 28 Sep 92) pp 58-64

[Article by T. N. Pavlovich, E. Z. Koval, and L. P. Sidorenko, Lvov Research Institute of Materials, Center for Innovations, Ukrainian Academy of Sciences, and Institute of Microbiology and Virology, Ukrainian Academy of Sciences, Kiev, under the rubric "Physiology and Biochemistry of Fungi"; UDC 620.193.8:582.288]

[Text]In spite of the expanded production of microassemblies that find application in the manufacture of electronic equipment, a complete description of their reliability under various ecological conditions has not yet been compiled. One of its indicators is resistance to fungi, which can be examined in direct relationship to properties of a material and their changes under the effect of various factors, including extreme ones (Astafyev, 1966; Flerov, 1972; Gerasimenko, 1984; Lugauskas et al., 1987). There are virtually no data on fungus resistance of thin- and thick-film elements of microassemblies used extensively in electronics (Blagnik, Zanova, 1965; Andreyuk et al., 1980; Gerasimenko, 1984; Kanevskaya, 1984; Zaikina, Yelinov, 1985; Koval, Sidorenko, 1989). Yet the structure of assembly materials and data on low fungus resistance of some of them warrant the assumption that microassemblies are vulnerable to fungi, particularly when used in regions with high humidity, as well as in tropical and subtropical climates.

This article deals with a discussion of the results of studying fungus resistance of thin- and thick-film elements of microassemblies under model conditions.

We tested fungus resistance of microassemblies consisting of thick-film elements based on various pastes—resistance, condenser, conductor, dielectric insulation and condenser, as well as thin-film elements based on resistance and dielectric alloys listed in the table.

Fungus-resistance characteristics of tested specimens

Name of microassembly specimens	Rating of fungus resistance, score	Lag phase, days	Maximum growth estimate, days	Viability of conidia, months	Condensate rating	Isolated fungus species
Thick-film elements based on paste						
Resistance 8000	0	—	—	—	1	—
Resistance 4004	0/3	10	25	3	3	*Aspergillus niger, Trichoderma viride*
Resistance 4005	0	—	—	1	1	—
Resistance 4006	0/3	5	15	5	2	*Aspergillus terreus*
Resistance 4007	0/4	15	25	2	2	*A. terreus, Penicillium funiculosum*
Resistance 4008	2	20	25	—	3	*A. niger*
Resistance 4009	0/3	10	20	3	2	*A. flavus, Penicillium chrysogenum*
Resistance 4010	0/4	10	25	2	2	*A. flavus*
Resistance 4011	1	25	30	—	2	*A. niger*
Resistance polymer 0630	0/3	5	15	2	2	*A. flavus Paecilomyces variotii*
Resistance polymer 0650	2/0	15	20	2	2	*A. flavus*
Resistance ruthenium 4400	3	5	10	—	3	*A. niger, Penicillium funiculosum*
Resistance ruthenium 4413	4/5	10/5	30/20	—	3	*A. flavus*
Resistance ruthenium 4451	4/5	15/10	30/25	—	3	*A. niger*
Resistance ruthenium 4461	4/5	15/5	30/20	—	3	*A. flavus + A. niger, Penicillium funiculosum*
Condenser 092	0	—	—	1	1	—
Conductor 3701	4/5	15/10	30/25	—	3	*A. niger*
Conductor 3711	1/4	20/10	25	—	3	*A. niger*

Fungus-resistance characteristics of tested specimens (Continued)

Name of microassembly specimens	Rating of fungus resistance, score	Lag phase, days	Maximum growth climate, days	Viability of conidia, months	Condensate rating	Isolated fungus species
Thick-film elements based on paste						
Dielectric insulation 8091	4/5	10/5	25/5	—	3	*Penicillium funiculosum*
Dielectric condenser 8021	4/5	20/10	30/25	—	3	*Paecilomyces variotii*
Thin-film elements based on alloys						
Resistance ST 3025	0	—	—	1	1	—
Resistance ST 3812	0	—	—	2	1	—
Dielectric DO 14-30	0/5	5	10	3	2	*A. flavus, Trichoderma viride*

Note: Assessment of fungus resistance: numerator—fungus resistance of microassemblies, denominator—resistance of underlayer. Viability of conidia: applied conidia showing no growth on specimens. Condensate rating: 1) few large drops that fall off readily; 2) numerous medium-sized drops, almost stationary; 3) small drops over the entire specimen, stationary.

The tests for fungus resistance were carried out in accordance with GOST 9.048...9.053-75 (with 1986 supplements). We used fungus strains isolated from specimens of analogous composition that had undergone field tests in different climate zones. Isolation, identification, determination of lag phase and viability of conidia of tested fungi were carried out by conventional techniques ("Methods of Experimental Mycology..., 1982). The tests were repeated 3-5 times. The findings were submitted to statistical processing. We assessed reliability of difference between experimental variants according to Student's criterion at 95 percent level of significance.

It was impossible to assess unequivocally the fungus resistance of the tested thin- and thick-film elements of microassemblies in all test variants; it differed and depended on a number of factors.

The principle of establishing the extent of growth of fungus colonies and giving it a score on the 30th day of the experiment served as the basis for determination of resistance of the materials to fungi (GOST 9.048...9.053-75). There is no special GOST [State standard] for microassemblies; however, the distinctions of fungal growth on them enable us to discuss the need to create one.

Microassemblies are a combined substrate consisting of variable ceramic or polymer materials in the form of an underlayer on which there are metal parts. The two elements of this substrate are not quite equal in accessibility to fungi due to the physicochemical properties of their surface. Evidently, this is what caused the differences in growth processes of micromycetes that were noted on the microassemblies.

Microassemblies are a specific substrate that does not contain the basic agents of mycodestruction essential to vital functions: carbon, nitrogen and available water. In this respect, metabolic processes of mycodestructive agents have not been sufficiently studied, which makes it difficult to analyze and assess their growth, and also delays development of protective measures. While in bacteria such substrates are interpreted as "nongrowth" elements and a detailed explanation of the possibility of functioning of different species on them is available, for fungi a classification of substrates according to this criterion has not been developed (Okorokov et al., 1974; Malashenko et all., 1982).

Investigation of the metabolism of mycodestructors requires new, modern approaches that permit deeper examination and explanation of the functional capacity of the fungal cell on substrates of anthropogenic origin that contain no organic matter, but permit normal metabolism of heterotrophs (Forster, 1950; "The Life of Microbes....," 1981). This has become particularly urgent at the present time, when basically new data are appearing to explain the specific metabolism of mycodestructors similarly to what has been established for bacteria (Cascelton, 1976; Zonneveld, 1988). For the time being, however, it is not deemed possible to explain the growth of mycodestructors on microassemblies, and we must limit ourselves merely to stating the facts on fungus resistance.

In assessing fungus resistance of the tested microassemblies, we observed differences in fungal growth as a function of the structure of their components. Three types of mycodestruction can be distinguished: 1) both the underlayer and elements are sensitive to fungi, 2) only the underlayer is sensitive to fungi, 3) only elements are sensitive to fungi (see Table). Most fungus-sensitive microassemblies are characterized by fungal damage to both components. Fungus growth was observed only on the underlayer in elements based on dielectric material DO 14-30. In resistors based on polymer paste 0650, only the paste was subject to mycodestruction (Figures 1 and 2).

Of all the fungal cultures used to infect microassembly specimens, the following formed a film and sporulated normally: *Aspergillus flavus, A. niger, A. terreus, Paecilomyces variotii, Penicillium chrysogenum, P. funiculosum,*

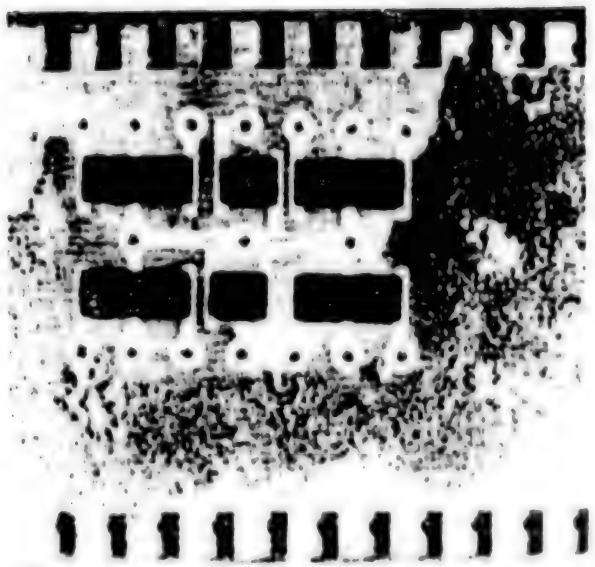

Figure 1. *Aspergillus flavus* colonies on underlayer

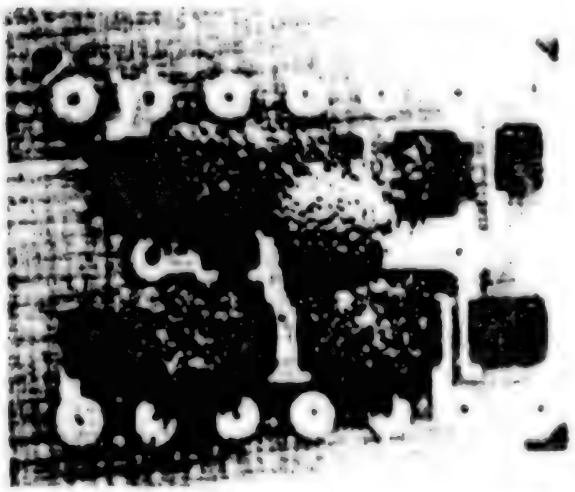

Figure 2. *Aspergillus flavus* colonies on elements

Trichoderma viride. Damage caused by only one fungal species was noted in 11 out of the 23 tested specimens, and incidence of fungi varied: *Aspergillus terreus* and *Paecilomyces variotii* developed only on one specimen; *Aspergillus flavus* on three, and *A. niger* on five. Combined damage by two fungal species was observed in five specimens, and by three species on one, but we were unable to detect any stable link in formation of these complexes. The most eurybiontic species also prevailed: *A. flavus* and *A. niger* (see Table). Multicomponent colonies did not differ either structurally or in sporulation time. Usually, *A. flavus* was the main background in the film, whereas *A. niger* was arranged in islets in its center. An analogous film structure was noted in variants with complexes of *A. flavus* + *Paecilomyces variotii*, *A. flavus* + *Penicillium funiculosum*, *A. niger* + *Trichoderma viride*. It is only in the variant of formation of a two-component film by the *A. terreus* + *Penicillium funiculosum* complex that their colonies were distinctly circumscribed with lumina of 1-2 mm between them, which did not disappear with age. This finding can be interpreted as a manifestation of antagonism on a certain level, which is known for many mycodestructors (Andreyuk et al., 1980). It is much more difficult to interpret the vulnerability of microassemblies to 1-2 fungal species, since joint presence of a rather considerable number of species, between which syntrophic interactions are established, is more often observed when fungi grow on inaccessible substrates (Blagnik, Zanova, 1965; Koval, Sidorenko, 1989).

We were unable to establish any pattern whatsoever or to explain the selectivity of fungi in relation to the corresponding series of tested specimens. In spite of the fact that assessment fungal growth in terms of rating the underlayer and microassembly did not always coincide, they were stricken by the same species of fungi. However, it must be noted that the underlayer played the leading role in manifestation of fungal growth in all variants of the experiment. Even in those cases where assessment of fungal growth in points almost coincided for both microassembly components as, for example, specimens of resistance ruthenium pastes 4413, 4451, 4461, conductor 3701, dielectric insulation 8031 and dielectric condenser 8021, the difference between underlayer and elements with respect to time of colony formation and conidial viability was distinctly demonstrable. The lag phase was shorter for all tested fungal species on the underlayer, whereas maximum growth rating was observed at earlier stages.

A correlation between fungal growth rating and nature of condensate was observed in all specimens (see Table). This can be explained if we compare the hydrophobic properties of the underlayers used. In this instance, the textolite underlayer was highly hydrophobic. This was confirmed when we carried out tests following a somewhat altered protocol, as compared to GOST, according to which the tested microassembly specimens were kept in a desiccator for 24 h at 98-100 percent humidity and temperature of 15-18°, following by heating at 26-28°C. In all specimens, the condensate differed in droplet size, quantity and mobility: 1) a small number of large drops, over 1-1.5 mm in diameter, that rolled off readily; 2) numerous droplets 0.5-1 mm in diameter, virtually stationary; 3) numerous drops 0.1-0.3 mm in diameter, stationary (Figure 3). The nature of condensate distribution on the specimens was analogous to the nature of drop formation when the specimens were inoculated with conidial suspension. Since moisture is the main factor affecting fungal function, in this instance too it was easy to track the relationship of fungus resistance to formation of condensate and hydrophoby of the microassembly surface (see Table). In the case of high water repellence of the microassembly surface, the drops of condensate or applied conidial suspension were notable for larger size and high mobility, which prevents adhesion of fungal conidia and, consequently, does not

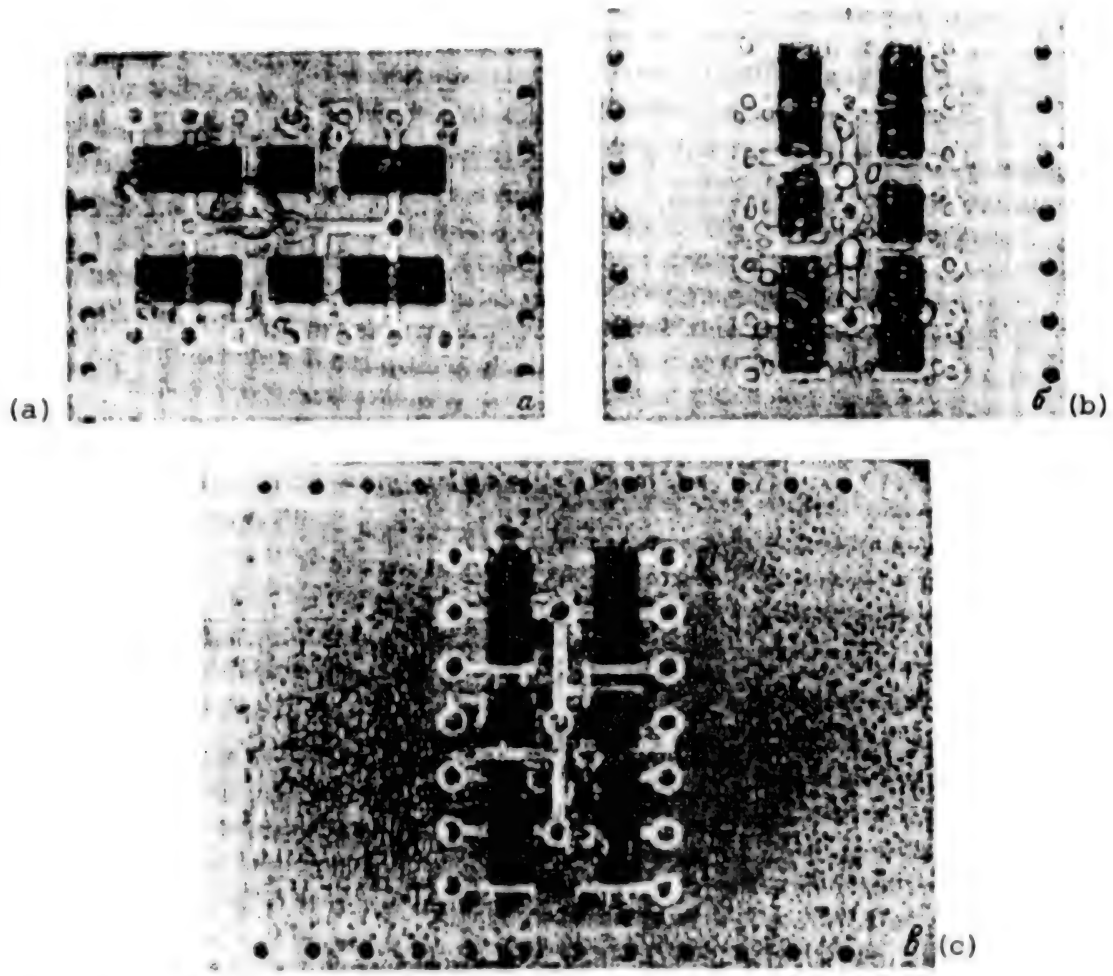

Figure 3. Various forms of condensate

Key: a) large drops, no distinct localization; b) medium-sized drops, localized on elements; c) small drops all over the specimen.

permit their further growth. Fungus resistance of resistors based on polymer paste 0630 with a textolite underlayer indicates that use of hydrophobic underlayers can be one of the methods of producing microassemblies that are impervious to mycodestruction.

Distortion of working parameters of microassemblies was observed not only with growth of conidia and formation of fungal colonies, but also in the case of a considerable level of contamination when the number of conidia exceeded 10^4 mm^2. This can be attributed to the effect of metabolic products of conidia that are produced in trace amounts even when conidia were in an anabiotic state ("Biology of Conidial Fungi," 1981). The observed destructive processes differed, depending on structure of the underlayer and microcircuit, analogously to the experimental variants in which colonies were formed. Evidently, evaluation of resistance of microassemblies to fungi must be made with consideration of several criteria characterizing the physicochemical properties of the surface (hydrophoby, porosity, moisture condensation, electric charge, etc.), and the assessment should be expressed as a fraction, which would correspond to the fungus resistance of the underlayer and fungus resistance of the microcircuit.

Since the methods used to determine fungus resistance of microassemblies do not provide reliable estimate and do not permit prediction of reliability of using them under diverse ecological conditions, the need arises to develop new models that conform better to naturally occurring contamination and mycodestruction processes.

References

1. Andreyuk, Ye. I., Bilay, V. I., Koval, E. Z., and Kozlova, I. A., "Mikrobnaya korroziya i yeye vozbuditeli" [Microbial Corrosion and Its Pathogens], Kiev, Nauk. dumka, 1980, 260 pages.

2. Astafyev, A. V., "Okruzhayushchaya sreda i nadezhnost radioelektronnoy apparatury" [The Environment and Reliability of Electronic Equipment], Moscow, Energiya, 1966, 40 pages.

3. Bekker, Z. E., "Fiziologiya i biokhimiya gribov" [Physiology and Biochemistry of Fungi], Moscow, Izd-vo MGU [Moscow State University], 1988, 230 pages.

4. Blagnik, R., and Zanova, V., "Mikrobiologicheskaya korroziya" [Microbiological Corrosion], Moscow, Khimiya, 1965, 220 pages.

5. Gerasimenko, A. A., "Zashchita mashin ot biopovrezhdeniya" [Protection of Machinery Against Biological Damage], Moscow, Mashinostroyenye [Machine-Building], 1984, 112 pages.

6. GOST 9.048...9.053-75 (with 1986 supplements), "Izdeliya tekhnicheskiye. Metody ispytaniy na ustoychivost k vozdeystviyu plesnevykh gribov" [Technical Products. Methods of Testing Resistance to Mold Fungi], adopted 11 May 1975.

7. Zhdanova, N. N., and Vasilevskaya, A. I., "Eksperimentalnaya ekologiya gribov v prirode i eksperimente" [Experimental Ecology of Fungi in the Environment and Experiments], Kiev, Nauk. dumka, 1982, 168 pages.

8. Kashner, D., ed., "Life of Microbes in Extreme Conditions," Moscow, Mir, 1981, 600 pages.

9. Zaikina, N. A., and Yelinov, N. P., "Damage to Microassembly Materials," OBMEN OPYTOM V RADIOPROMYSHLENNOSTI, 1985, No 11, p 55.

10. Kanevskaya, I. G., "Biologicheskiye povrezhdeniye promyshlennykh materialov" [Biological Damage to Industrial Materials], Leningrad, Nauka, 1984, 230 pages.

11. Koval, E. Z., and Sidorenko, L. P., "Mikodestruktory promyshlennykh materialov" [Mycodestructors of Industrial Materials], Kiev, Nauk. dumka, 1989, 192 pages.

12. Lugauskas, A. Yu., Mikulskene, A. I., and Shlyauzhene, D. Yu., "Katalog mikromitsetov-biodestruktorov polymernykh materialov" [Catalogue of Micromycetes, Biodestructors of Polymers], Moscow, Nauka, 1987, 340 pages.

13. Malashenko, Yu. R., Sokolov, I. G., and Romanovskaya, V. A., "Mikrobnyy metabolizm nerostovykh substratov" [Microbial Metabolism of Non-growth Substrates], Kiev, Nauk. dumka, 1982, 192 pages.

14. Bilay, V. I., ed., "Metody eksperimentalnoy mikologii. Spravochnik" [Guide: Methods of Experimental Mycology], Kiev, Nauk. dumka, 1982, 538 pages.

15. Okorokov, L. A., Lichko, L. P., Kadomtseva, V. M., et al., "Metabolism and Physicochemical State of Ions in Fungi," MIKROBIOLOGIYA, 1974, Vol 18, No 3, pp 342-347.

16. Flerov, B. K., "Biological Damage to Industrial Materials and Goods Made With Them," "Problemy biologicheskikh povrezhdeniy i obrastaniy" [Problems of Biological Damage and Overgrowth], Moscow, Nauka, 1972, pp 3-8.

17. Forster, D., "Chemical Activity of Fungi," Moscow, IL [Foreign Literature Press], 1950, 650 pages.

18. Cole, G. T., and Kendric, B., eds., "Biology of Conidial Fungi," New York, Acad. Press, 1981, Vol 2, 560 pages.

19. Cascelton, P. J., "Anapleurotic Pathways," "The Filamentous Fungi. V. Biosynthesis and Metabolism," J. E. Smith, D. E. Berry, eds., London, Edw. Arnold, 1976, pp 121-136.

20. Fassatiova, O., "Plisne o vlaknite houby v technicke mikrobiologii" [in Czech], Prague, SNTL, 1979, 237 pages.

21. Wainwright, M., and Killham, K.,"Sulphur Oxidation by Fusarium Solani," SOIL BIOL. BIOCHEM., 1980, No 12, pp 555-558.

22. Zonneveld, B. J., "Effect of Carbon Dioxide on Fruiting in Aspergillus Nidulans," TRANS. BRIT. MYCOL. SOC., 1988, Vol 91, Pt 4, pp 625-629.

Effect of Liposomas on Condition of Tissue Respiration in Animals in Case of Acute Hypoxic Hypoxia

94C0063A Kiev FIZIOLOGIHESKIY ZHURNAL in Ukrainian Vol 39 No 4, Jul,Aug 93 pp 100,103

[Article by M.M. Seredenko, A.I. Nazarenko and T.V. Kukoba; Physiology Institute imeni O.O. Bogomolets, AN [Academy of Sciences] of Ukraine, Kiev]

[Abstract] The effect of injection of liposomas on oxygen consumption by brain, lung, liver and femoral muscle tissues in the case of acute hypoxic hypoxia caused by inhalation of gas mixtures of nitrogen and 6.7,7.1% oxygen was studied in experiments on 45 male white rats (Wistar line). Acute hypoxic hypoxia was induced by inhalation of the gas mixture for 60 minutes; at the 30th minute of hypoxia a suspension of a newly developed preparation "lipin" (using phospholipid liposomas as antihypoxanths and antioxidants) in a physiological solution was injected intravenously. The technique of determining the hypoxic hypoxia effect is described. After suffering acute and grave hypoxic hypoxia oxygen consumption in intact animals (a control group) increased considerably in all tissues except lung tissues.

After lipin injection oxygen debt in the studied tissues decreased substantially or completely disappeared. In vitro injection of lipin did not affect oxygen consumption by the tissues. It is suggested that in the presence of liposomas body tissues practically do not experience oxygen deficiency. A conclusion is made that lipin injection can be effectively used to prevent development of the secondary tissue hypoxia. Table 1, references 8.

Effect of Liposomas on Condition of Tissue Respiration in Animals in Case of Acute Hypoxic Hypoxia

94C0063A Kiev FIZIOLOGIICHESKIY ZHURNAL in Ukrainian Vol 39 No 4, Jul,Aug 93 pp 100,103

[Article by M.M. Seredenko, A.I. Nazarenko and T.V. Kukoba; Physiology Institute imeni O.O. Bogomolets, AN [Academy of Sciences] of Ukraine, Kiev]

[Abstract] The effect of injection of liposomas on oxygen consumption by brain, lung, liver and femoral muscle tissues in the case of acute hypoxic hypoxia caused by inhalation of gas mixtures of nitrogen and 6.7)7.1% oxygen was studied in experiments on 45 male white rats (Wistar line). Acute hypoxic hypoxia was induced by inhalation of the gas mixture for 60 minutes; at the 30th minute of hypoxia a suspension of a newly developed preparation "lipin" (using phospholipid liposomas as antihypoxanths and antioxidants) in a physiological solution was injected intravenously. The technique of determining the hypoxic hypoxia effect is described. After suffering acute and grave hypoxic hypoxia oxygen consumption in intact animals (a control group) increased considerably in all tissues except lung tissues. After lipin injection oxygen debt in the studied tissues decreased substantially or completely disappeared. In vitro injection of lipin did not affect oxygen consumption by the tissues. It is suggested that in the presence of liposomas body tissues practically do not experience oxygen deficiency. A conclusion is made that lipin injection can be effectively used to prevent development of the secondary tissue hypoxia. Table 1, references 8.

Dynamics of Destructive and Reparative Processes in the Immune System's Organs in Cases of Acute Experimental Peritonitis Progressing With Different Courses

937C0406F Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 115 No 5, May 93 (manuscript received 26 Jan 93) pp 533-536

[Article by V.Ya. Glumov, N.A. Kiryanov, Ye.L. Bazhenov, and G.S. Ivanova, Pathologic Anatomy Department (head, Professor V.Ya. Glumov), Izhevsk Medical Institute; UDC 616.381-002.1-092:612.017.1]-092.9-07]

[Abstract] A study examined the dynamics of destructive and reparative processes occurring in the immune system's peripheral organs during the usual course of acute experimental peritonitis, against the background of the administration of immunoregulators (azathioprine and levamisole), and under conditions of hypertoxicosis. The experiments were performed on 220 white rats in which acute experimental peritonitis had been induced. The animals were divided into five groups: Group 1 consisted of 120 rats with acute experimental peritonitis progressing along the conventional course, group 2 consisted of 35 rats with acute experimental peritonitis that were receiving immunodepressive therapy with azathioprine (4 mg/kg per os once daily for two weeks), group 3 consisted of 35 animals with acute experimental peritonitis that were receiving immunostimulation by levamisole in doses of 2-2.5 mg/kg daily for three days in the form of three courses with six day intervals between them, group 4 consisted of 20 animals with acute experimental peritonitis and hypertoxicosis resulting from 2-3 injections of 1.5 ml of a three percent fecal suspension into their abdominal cavities, and group 5 consisted of 10 control animals into whose abdominal cavities a physiologic solution in the very same volume had been injected. Twelve of the group 1 animals died in the first few days of the experiment, 10 group two animals died during the first three days, no group 3 animals died, and 5 of the group 4 animals died at different times during the experiment. In the case of the group 1 animals (i.e., the animals experiencing the usual course of acute experimental peritonitis), a sharp increase in lymphocyte destruction coupled with a decrease in proliferative changes was noted during the first 24 hours. After two days, the cell destruction decreased, but the proliferative changes increased. In the animals receiving levamisole, destructive processes were not as pronounced; however, the proliferative processes persisted at a high level during the entire experiment. In the animals receiving azathioprine, destructive processes were found to increase intensively during all periods of the experiment, and reparative processes were simultaneously suppressed. The result was devastation of their immune system organs to an extent equivalent to that occurring in cases of secondary immunologic insufficiency. The benefits of levamisole in cases of acute experimental peritonitis were thus confirmed: It slowed the destructive processes typically occurring in the immune system's organs while significantly intensifying synthetic and proliferative processes, thus ultimately creating a foundation for the more rapid arrest of inflammation in the abdominal cavity. Figures 4; references 11: Russian, Western.

Effect of Low Doses of Emoxypine and Pyridoxine Hydrochloride on the Condition of Patients With Cataract and Glaucoma

937C0406B Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 115 No 5, May 93 (manuscript received 25 Dec 92) pp 479-481

[Article by N.P. Yanovskaya, V.N. Shtolko, and Ye.B. Burlakova, Chemical Physics Institute, Russian Academy of Sciences, Chernogolovka, and Eye Microsurgery Interbranch Scientific-Technical Complex, Moscow; UDC 617.741.004.1-036-07+615.425.1-092]

[Abstract] Synthetic antioxidants are used to protect the retina against injury developing against the background of activation of free-radical oxidation reactions. Natural lipophilic antioxidants of tocopherol, melanoproteins of the pigment epithelium, and enzyme systems (superoxide dismutase and glutathione peroxidase) provide antioxidation protection in the eye's structures. The drug emoxypine is an antioxidant that was developed at the Department of Chemical and Biological Process Kinetics at the Chemical Physics Institute of the Russian Academy of Sciences and introduced into ophthalmologic practice in 1986. A study examined the efficacy of aqueous solutions of emoxypine in a concentration of 0.015 percent (10^{-3} M) and its natural analogue pyridoxine in concentrations of 0.2 to 0.02 percent (10^{-2} and 10^{-3} M) in the treatment of outpatients with initial cataract and glaucoma. The drugs were administered in the form of instillations of 2 drops twice daily for 20-30 days into 63 eyes of 33 cataract patients and 33 eyes of 17 glaucoma patients. The drugs' effects on the healthy eyes of 10 volunteers were also examined. Subjective improvements in vision (i.e., the disappearance of "flecks" and black spots and a decrease in eye fatigue during close-up work) were reported 10 days after the beginning of pyridoxine administration. The visual acuity of 86 percent of the cataract patients receiving pyridoxine in a 0.02 percent concentration also increased after 10 days: Patients in the early stage of cataract disease reported significant expansions of their field of vision, and a statistically significant difference between the sensitivity of dark and light eyes to the drug's effect was noted (light eyes were more sensitive). The positive effects of pyridoxine were confirmed to persist 1 month after the 30-day course of treatment had been completed. The patients receiving a 0.2 percent solution of pyridoxine demonstrated increased visual acuity after only 20 days of treatment. After longer periods, they experiences somewhat of a decrease in visual acuity; however, their field of vision continued to expand. In glaucoma patients, the use of a 0.02 percent solution of pyridoxine along with pilocarpine was found to intensify the latter's therapeutic effect. A double-blind study was conducted to assess the effect of a 0.015 percent solution of emoxypine on the pupils and tonographic indicators of 19 cataract patients (38 eyes). Drops of a physiologic solution of emoxypine did not change the width of the patients' field of vision or tonographic indicators, and the patients' pupils contracted an average of 0.14 mm 20-30 minutes after the drops were administered and an average of 0.33 mm 40-60 minutes after administration of the drops. The patients' intraocular pressure decreased by 1.68 +/- 0.61. The studies thus indicated that both emoxypine and pyridoxine affect eyes' cholinoreactive structures and may be useful in treating glaucoma and early stages of cataract. Tables 4; references 11 (Russian).

Effect of Endogenous Metabolites on the Autoregulation and Dilatory Reserve of Coronary Vessels

937C0406A Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 115 No 5, May 93 (manuscript received 30 Dec 92) pp 456-458

[Article by A.P. Solodkov and A.P. Bozhko, Normal Physiology Department, Medical Institute, Vitebsk; UDC 612.17.1]

[Abstract] A study examined the effects of selected metabolites formed in the coronary vessel walls and myocardium, i.e., eicosanoids, angiotensin II, and nitrogen oxide, on the coronary vessels' autoregulation and dilatory reserve. The experiments were performed on hearts isolated from 48 female rats weighing 170 to 230 g each as the perfusion pressure was gradually increased within the range from 40 to 100 mm Hg. The hearts were perfused with Krebs-Henseleit buffer (pH 7.3-7.4, t = 27°C) enriched with carbogen (95 percent O_2 and 5 percent CO_2). The rat hearts were divided into five groups: Group 1 (n = 8) served as controls, group 2 (n = 7) hearts were treated with verapamil (added to the perfusion solution in the amount of 10^{-7} M), group 3 (n = 7) hearts were treated with indomethacin (in a dose of 10 mg/kg per os for 3 days), group 4 hearts (n = 7) were treated with captopril (administered as a one-time injection in a dose of 10 mg/kg and then added to the perfusion fluid until an ultimate concentration of 36 mg/l was reached), and group 5 hearts (n = 7) were treated with N_G-monomethyl-l-arginine [N^GMMLA] (injected into the aortal canula over a 10-minute period under a perfusion pressure of 1/40 the volume coronary flow rate until a final concentration of 100 μM was reached). Electrical stimulation was used to contract the hearts at a rate of 240 times/min. Coronary dilative reserve was determined at perfusion pressures of 40, 80, and 120 mm Hg. It was defined as the ratio between the maximum hyperemic coronary flow developed after the perfusion had been stopped for 60 seconds and the starting flow. The index of autoregulation, reflecting the vessels' ability to respond to an increase in perfusion pressure by contracting, was determined as described previously. The effectiveness of blocking of NO-synthesis was judged by the degree of decrease in perfusion pressure after a bolus (100 μl) intracoronary injection of acetylcholine (3×10^{-4} M). Captopril, indomethacin, and verapamil increased the volume coronary flow rate at perfusion pressures of 80 to 120 mm

Hg, decreased the autoregulation index and coronary vasodilatory reserve by 28-39 percent, but did not affect maximum reactive hyperemia. The blocking of NO-synthesis by N^G-MMLA resulted in a 28.5 decrease in the volume coronary flow rate at a perfusion pressure of 40 mm Hg, a 79 percent decrease in the autoregulation index, and a 29 percent decrease in coronary reserve as a resykt of a reduction in reactive hyperemic flow. Captopril and N^G-MMLA did not alter intraventricular pressure; however, verapamil and indomethacin decreased it by 60 and 30 percent, respectively. It was concluded that the decrease in the volume coronary flow rate observed after injection of N^G-MMLA is probably not dictated by a change in functional activity of the myocardium. The fact that verapamil induced the most significant changes in autoregulation of coronary flow was taken as evidence that autoregulation of coronary vessels is a calcium-dependent phenomenon. The experiments were considered proof of the fact that the tonus of the smooth muscles of the coronary vessels are affected by the eicosanoids, angiotensin II, and nitrogen oxide, which are continuously formed not only in the myocardium but also in the walls of the vessels themselves and which constitute a system modulating the autoregulation of coronary flow regardless of shifts in the myocardium's functional activity. Figures 2, table 1; references 11: 1 Russian, 10 Western.

Effect of T-Activin on Macrophage 5-Nucleotidase Activity and Hydrocortisone Level in Blood Depending on the Time of Day

937C0406E Moscow BYULLETEN EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 115 No 5, May 93 (manuscript received 13 Jan 93) pp 519-521

[Article by G.B. Kirillichev, I.G. Baturina, V.V. Mitkin, M.S. Solovyeva, and G.T. Sukhikh, Epidemiology and Microbiology Scientific Research Institute imeni N.F. Gamaley, Russian Academy of Medical Sciences, Russian Perinatology, Obstetrics, and Gynecology Scientific Research Center, Moscow; UDC 615.275.4.015:[612.129:577.175.534].076.9]

[Abstract] The effects of T-activin on peritoneal exudate macrophage activity and hydrocortisone levels were studied. The experiments were performed on CBA and C57B1/6 female mice in the autumn. The mice were administered subcutaneous injections of T-activin at 600 to 1800 hours in doses of 10^{-6}, 10^{-3}, and 1 μg/mouse. 5-Nucleotidase activity in macrophages of peritoneal exudate obtained from the mice and the levels of hydrocortisone in their blood were determined 3, 12, and 24 hours after the T-activin injections. The T-activin injections altered both peritoneal exudate macrophage activity and hydrocortisone level. The changes in 5-nucleotidase activity in the peritoneal exudate macrophages obtained form the CBA and C57B1/6 mice were compared. The changes in 5-nucleotidase occurring after T-activin injections administered both in the morning and in the evening were a mirror image of the dynamics of the change in C57B1/6 mice. A comparison of the dynamics of 5-nucleotidase activity and hydrocortisone level established that in the C57B1/6 mice receiving T-activin injections in the morning and evening, the curve plotted for the change in 5-nucleotidase activity was generally a repetition of that plotted for the change in hydrocortisone level. Just as was the case with the C57B1/6 mice, in the CBA mice injected with T-activin in the morning, there was a direct correlation between the level of 5-nucleotidase activity in the peritoneal exudate macrophages and the level of hydrocortisone in the blood. In the case of CBA mice injected with T-activin in the evening, on the other hand, the changes in the level of hydrocortisone in the blood appeared to be a mirror image of the dynamics of 5-nucleotidase activity in the peritoneal exudate macrophages. In the CBA mice, the nature of the connection between 5-nucleotidase activity and hydrocortisone level depended not only on the time of day when the injection was administered but also on the time elapsed since the injection: 1 day after a morning injection, the dose-effect curve plotted for 5-nucleotidase activity was a reflection of the curve plotted for the change in hydrocortisone level, whereas dose-effect curves plotted for 5-nucleotidase activity and hydrocortisone level 12 hours after a morning injection of T-activin were mirror images of one another rather than direct reflections of one another. The studies thus established that the correlation between 5-nucleotidase activity and hydrocortisone level is not absolute but rather depends on genotypic distinctions between organisms, the time of day at which the T-activin injection is administered, and the duration of the study. Figures 2; references 8: 7 Russian, 1 Western.

Effect of Tryptophan on Regulatory Neuropeptide and Cyclic Nucleotide Levels in Brain and Blood

937C0343a Moscow PROBLEMY KNDOKRINOLOGII in Russian Vol 39 No 3, May-Jun 93 [Manuscript received 10 Mar 92] pp 45-46

[Article by V. V. Lobov, V. S. Pospelov, and A. N. Bykhovtsev, Central Scientific Research Laboratory, Omsk Medical Institute; UDC 616.831-008.94:577.175.823]-02-07

[Abstract] The effect on CNS serotoninergic regulatory mechanisms of pharmacological activation, as evidenced by the effect on levels of neuropeptides and cyclic nucleotides in the brain and blood, was studied in 24 healthy dogs. Plasma ACTH and arginine-vasopressin were measured 2 hours after tryptophan administration. Brain tissue from the parietal area was isolated cryogenically, and serotonin, beta-endorphin, and cyclic nucleotide levels were measured. Elevation of brain serotonin and beta-endorphin levels, as well as blood ACTH and vasopressin levels, was noted. This was a result of tryptophan activation of the hypothalamus-hypophysis system. Levels of cAMP in the brain were not significantly increased, while those of cGMP decreased. The results indicate that tryptophan activates a central serotoninergic regulatory mechanism which induces the endogenous opioid system and the production of hypophysal hormones. References 15: 8 Russian, 7 Western.

Interview With Head of Humanitarian Aid Commission

937C0291A Moscow TRUD in Russian 28 Jul 93 p 2

[Article; "Donations for Russia: Do They Reach The Designated Recipient?"; first paragraph is TRUD introduction]

[Text]There was a delegation of the Russian Government Commission on Humanitarian and Scientific-Technical Aid, headed by A. A. Zhitnikov, its deputy chairman, in the FRG. It discussed matters of further collaboration, participated in preparation of a new document that deals with various aspects of relations between the two countries in this direction. Our Bonn correspondent, R. Kolchanov, took advantage of this opportunity to interview A. A. Zhitnikov:

[Question] What is the extent of humanitarian aid and how large a part is Germany playing in it?

[Answer] Humanitarian aid to Russia is coming from more than 60 countries. Last year, we received about 500,000 tons of foodstuffs, as well as many drugs and medical equipment both along government lines and from hundreds of private organizations. In the first half of this year, the volume of food aid alone constituted a million tons. Germany's share is quite appreciable. Let me mention such major organizations as the German Red Cross and CARE-Deutschland. Of course, we have expressed our most sincere appreciation to all donors who have to exert much effort to collect and transport food.

[Question] The aid is intended primarily for the socially depressed population strata in Russia....

[Answer] According to our estimates, they constitute 30-35 million people: pensioners, invalids, large families, refugees who have left their homeland because of conflict situations.

[Question] Humanitarian aid is usually given for a specific, short period of time, but the factors you have mentioned will apparently prevail, regrettably, for a long time to come in our country. Shall we seek aid in the future also?

[Answer] In the difficult transitional period that Russia is experiencing, millions of people are in need of social support. The government is making an utmost effort to alleviate their situation, but we do not have enough funds. As of June, the deficit in the budget earmarked for social programs constituted about 150 million rubles, and this does not include health care or expenses related to migration. We are trying to bridge the gap at the expense of humanitarian aid. For example, deliveries, in the form of aid, of American grain will enable us to get about 25 billion rubles to support the needy. In this regard, we are negotiating with other governments as well. So that humanitarian aid to Russia is simply a necessity for the time being.

[Question] Does it really reach the people for whom it is intended and to a full measure?

[Answer] There are representatives of different departments, nongovernment organizations and clergy in our Commission. There are local humanitarian aid headquarters. Administration heads are personally responsible for its distribution. In recent years direct contacts are developing, and we are encouraging this: hospital to hospital, city to city, and foreign children's institutions to ours.

[Question] Still, there are quite a few reports, including some in the German mass media, to the effect that some of the aid is being stolen and sold through speculative entities.

[Answer] Humanitarian aid from foreign countries is handled in two ways: it is sent directly to the needy, or it is sold. For example, you cannot deliver grain from door to door, and the proceeds from it go to pensioners, students and school lunches. That was the case, for example, with the 155,000 tons of food received through the Commission of European Communities. In Moscow, the proceeds from selling it constituted 4.6 billion rubles and in St. Petersburg, 2.5 billion. The moneys went to the needy.

We proceeded similarly with the 18,000 tons of American butter, 100,000 tons of Taiwan rice and several other forms of humanitarian aid. I should like to stress that, in principle, we coordinate our actions with the donors who deliver these products to us. Our aim is to have part of the humanitarian aid used "for the future," for development of production.

[Question] The Commission does not have its own shops. Through what channels is such aid implemented?

[Answer] We are making a careful study of the capabilities of those who express the wish to participate in handling products received as aid. Sale is categorically prohibited without the Commission's special permission. The entire process is reflected in documentation, and we monitor it through the pertinent departments.

[Question] Nevertheless, one can find products obviously received in the form of humanitarian aid in numerous stands loaded with alcoholic beverages and smoking materials.

[Answer] We have checked this repeatedly. We learned that the products are offered to the stand owners by those who received them as aid in order to use the proceeds for other, more needed items. We are much more concerned with the instances of direct stealing.

[Question] Is there much theft?

[Answer] The losses from theft constituted about 35 million rubles. Of course, this is very sad and outrageous. But the losses related to selling items of humanitarian aid are much lower, as compared to the total aid which amounted to about 35 billion rubles last year, than in

ordinary trade. It is nonsense that the commercial structures supposedly get rich from this aid. Anyone who sells products with our permission sets prices that are slightly below market prices for speedy sale, and is compensated only for inevitable expenses, for example, transport.

The Commission, however, does not spend a single ruble of deductions from humanitarian aid to maintain its staff of 18 people.

[Question] However, you are the target of unfavorable criticism?

[Answer] I wish to note that humanitarian aid is often used in Russia as an arena for political battle. What sins have not been placed upon us! However, recently, a commission of the Ministry of Finance Control Administration failed to find any abuses in our performance.

[Question] I should like to hope that soon potentially wealthy Russia will no longer have to seek help in foreign countries....

[Answer] We are experiencing a very difficult period, but there is no turning back. The road ahead toward implementing reforms, with consideration of present needs and interests of the socially less protected strata of the population, should ultimately lead to success.

RF Decree on Psychiatry

937C0407A Moscow ROSSIYSKIYE VESTI in Russian 17 May 93 pp 4-6

[Decree No 377 of the Council of Ministers—Russian Federation Government On Implementation of the Russian Federation Law "On Psychiatric Aid and Citizen Rights When Rendered" signed by V. Chernomyrdin, chairman of the Council of Ministers—Russian Federation Government, on 28 Apr 93]

[Text]To implement the decree of the Supreme Soviet of the Russian Federation dated 2 July 1992, "On Procedure for Putting Into Effect the Law of the Russian Federation 'On Psychiatric Aid and Citizen Rights When Rendered,'" the Council of Ministers—Russian Federation Government hereby decrees to:

1. Adopt the attached List of medical psychiatric contraindications for different forms of professional activity and activity related to sources of high risk, and Statute on procedure of issuing licenses for rendering psychiatric aid to State, non-State, psychiatric, neuropsychiatric institutions, and psychiatrists in private practice.

2. Establish that psychiatrists, other specialists and health care workers with special training and necessary qualifications are allowed to participate in psychiatric care. Qualifications, as well as upgrade of qualifications, are confirmed following procedure established by the Russian Federation Ministry of Health.

The question of allowing health care workers to participate in psychiatric care is decided by the administrator of a psychiatric and neuropsychiatric institution or psychiatrist in private practice in accordance with existing legislation.

3. Ask the Russian Federation Ministry of Labor to examine, following established procedure, the question of extending the total annual vacation time for health care and other personnel involved in rendering psychiatric care.

4. Ask the Russian Federation Ministry of Health, together with the Russian Federation Ministry of Justice, Russian Federation Ministry of Public Protection and other concerned ministries, State committees and departments of the Russian Federation to accomplish the following before 15 September 1993: prepare draft laws on amendment of legislative acts of the Russian Federation related to adoption of the Russian Federation Law "On Psychiatric Aid and Citizen Rights When Rendered," for subsequent submittal to the Russian Federation Supreme Soviet; develop and submit for approval to the the Council of Ministers Russian Federation Government draft statutes on: institutions rendering extramural and in-hospital psychiatric aid; "therapy-oriented industrial enterprises to provide occupational therapy, training in new occupations and job placement at said enterprises, for individuals with mental disorders, including invalids; dormitory facilities for individuals with mental disorders who have lost social contact.

Statute on Procedure for Issuing Licenses for Psychiatric Care to State, Non-State Psychiatric, Neuropsychiatric Institutions, and Psychiatrists in Private Practice

Approved by Decree No 377 of the Council of Ministers—Russian Federation Government on 28 April 1993.

1. In accordance with Article 18 of the Russian Federation Law "On Psychiatric Aid and Citizen Rights When Rendered," State, non-State psychiatric and neuropsychiatric institutions (hereafter referred to as institutions) and physicians in private practice must have a State license to render psychiatric aid (hereafter referred to as license) in order to render psychiatric care.

It is prohibited to engage in psychiatric aid without a license.

2. The license indicates the complete name of institution or surname, name and patronymic of a psychiatrist in private practice, their legal address and types of medical activities involved in psychiatric care for which permission is granted.

3. Licenses are issued by licensing commissions (hereafter referred to as commissions) formed in State administrative agencies.

4. In order to obtain a license, institutions and psychiatrists in private practice submit an application to the

commission, with indication of types of medical activities to render psychiatric care and the following documents: for institutions: charter or statute approved following established procedure; founding contract or contract on joint activities; documents about structure and staff of the institution, qualifications of employees; documents about available space, instruments and equipment conforming to the requirements imposed for the declared forms of activities; finding as to technical condition of building; for psychiatrists in private practice: copy of diploma received upon graduating from a higher medical educational institution; copy of work book [service record] confirming tenure in the field of psychiatry; other documents confirming qualifications of the psychiatrist and his performance in rendering psychiatric care; documents about available space, instruments and equipment conforming to requirements imposed on declared forms of activities; finding as to technical condition of building.

5. The commission examines applications for a license from institutions and psychiatrists in private practice within 2 months from the day the applications are received with all necessary documentation.

6. In the event issuance of the license is refused, the commission informs the applicant in writing about the reasons for the refusal, which may be appealed in legal form.

7. The names of institutions and psychiatrists in private practice are recorded in the pertinent unified State register.

8. A license may be suspended or revoked by a court decision. List of medical psychiatric contra-indications for some forms of professional activities and activities related to source of danger. Medical psychiatric contra-indications for some forms of professional activities related to effects of toxic substances and deleterious industrial factors

Approved by decree No 377 of the Council of Ministers Russian Federation Government dated 28 April 1993: 1. Chronic and protracted mental disorders with severe, persistent or frequently exacerbated pathological manifestations, epilepsy with paroxysmal disorders constitute general medical psychiatric contra-indications for the types of work listed in the table. Marked forms of borderline mental disorders are discussed individually in each case. Additional contra-indications are listed in Column 2 2. Certification must be repeated at least once every five years. 3. General laboratory and functional tests; electroencephalography.

Hazardous and deleterious substances and industrial factors (A denotes allergens)	Jobs. ADDITIONAL MEDICAL PSYCHIATRIC CONTRAINDICATIONS
1	2
Chemical	
Nitric acid	Production and use, processes related to recovery thereof
Ammonia	Same
Nitrous oxides	Production and use of acrylonitrile, methyl methacrylate, ethyl acrylate and others
Acrylic and methacrylic acids, esters thereof, nitriles A	Same
Amino-, nitro-, nitroso-nitro-chloro compounds of aromatic series	Production and use of trinitrotoluene, dinitrophenol, dinitrobenzene, aniline, trimethylene trinitramine, dinitrochlorobenzene and others, urotropin. Production and use of xylidine, cresols, picric acid and others
Amino compounds of aliphatic series and their derivatives	Production and use
Ethylenimine and other immuno compounds A	Same
Amines of aromatic series: benzidine and compounds thereof, dianisidine, toluidine and compounds thereof, naphthylamines	Production and use (including laboratory work). Use of dyes based on them
Barium and compounds thereof	Production and use of soluble barium compounds. Production and use of insoluble barium compounds
Benzene and its derivatives (toluene, xylene, styrene and others).	Production and use (including laboratory work) of benzene. Production and use of homologues and derivatives of benzene (isopropylbenzene, styrene, toluene and others). ADDITIONAL CONTRAINDICATIONS: TOXIC AND NARCOTIC SUBSTANCE ADDICTION
Halide derivatives of aromatic series	Same
Halide benzyls, benzylidene chloride	Same
Azo dyes	Production and use Anthraquinone, phthalocyanyl [typo for cyanine?]
dyes	Same
Beryllium and compounds thereof A	Production and use of metal beryllium and compounds thereof, preparation of blend, mechanical processing of ceramic items made of beryllium oxide, production of beryllium-containing alloys
Beta-naphthol	Production and use

Hazardous and deleterious substances and industrial factors (A denotes allergens)	Jobs. ADDITIONAL MEDICAL PSYCHIATRIC CONTRAINDICATIONS
1	2
Bromine and compounds thereof	Production and use
Halide derivatives of hydrocarbons of fatty series	Production and use (including laboratory work) of dichloroethane, carbon tetrachloride, vinyl chloride, methylene chloride, methyl chloride, chloroform, ethyl bromide, trichloroethylene, chloroprene and others ADDITIONAL CONTRAINDICATIONS: TOXIC SUBSTANCE ADDICTION
Hydrazine and compounds thereof	Production and use
Dimethyl formamide, dimethyl acetamide and others fatty acid amides	Production and use
Isocyanates A	Production and use
Artificial and synthetic fibers A	Production. Mechanical processing, dyeing: a) processing of fibers (oxalon, synthetic high-polymer materials, aramide, carbon-containing); b) heat treatment. Preparation and use of lubricants
Cadmium and compounds thereof	Production and use
Coke-oven gas and other coking products	Production of coke and coke-oven gas, trapping coking products, rectification of trapped hydrocarbons, distillation and processing of coal tar at coking by-product plants. Work involving preparation and paving with bitumen concrete, with use of products of the coking by-product industry (coal tar, resin, sand, and others)
Silicone compounds and lubricants based on them A	Production and use
Lithium and compounds thereof	Production and use
Manganese and compounds thereof	Production and use of manganese oxides, welding materials (electrodes, powdered-metal wire, flux). Casting manganese steel and other metals containing more than 10% manganese, production of organic manganese compounds. Extraction of ore and processing thereof, use of inorganic manganese compounds in ground form
Methanol	Production and use, processes related to its recovery
Arsenic and compounds thereof	Extraction, production and use of organic and inorganic arsenic compounds; processes related to their recovery
Nickel A and compounds thereof	Production and use
Organic vulcanization accelerants, antiagers, vulcanization inhibitors and others A	Production and use of captax, altax, thiuram, neozone D and others
Perhydrol	Production and use
Pesticides	Production and use in the national economy of organochlorine, organophosphorus, carbamic acid derivatives, organometal and other pesticides, as well as storage in warehouse and primary cotton processing
Saturated and unsaturated hydrocarbons	Operation, repair of wells and installations in extraction of oil, processing high-sulfur and sulfur oil, natural gas, pyrobenzene; selective purification of oils; pyrolysis; removal of hydrogen sulfide from oil and gas; cleaning tankers, tanks, reservoirs; ozocerite-extracting production; production of various synthetics (phenol, acetone, synthetic fatty acids, alcohols and others). Ancillary processes related to servicing freight yards, taking samples, laboratory testing of raw intermediate and end products (high-sulfur and sulfur oil and natural gas). Operation, repair of wells in oil extraction; processing low-sulfur petroleum and natural gas; extraction and processing of ozocerite, regeneration of motor vehicle and aircraft oils; processes related to recovery and use of saturated, unsaturated hydrocarbons (production of polyethylene, divinyl, isoprene and others); use of benzine. ADDITIONAL CONTRAINDICATIONS: TOXIC AND NARCOTIC SUBSTANCE ADDICTION
Rare-earth elements	Industries related to recovery of aerosols of rare-earth elements and compounds thereof
Mercury and compounds thereof	Extraction and melting of mercury and other processes related to its recovery and purification; use for extraction of gas-discharging gold and other metals; production of mercury thermometers and fluorescent lamps, other physical and illumination-engineered instruments, paint, organic mercury compounds; production of substances by mercury electrolysis. Work with instruments in contact with exposed mercury, production of mercury fulminate; work with mercury-arc rectifiers, current transformers, pumps; use as catalysts in chemical processes; use of organic mercury compounds. Production and work with instruments with sealed mercury, use of mercury fulminate in underground mining; work in dental offices with mercury amalgam; production of pharmaceuticals and cosmetic preparations containing mercury

Hazardous and deleterious substances and industrial factors (A denotes allergens)	Jobs. ADDITIONAL MEDICAL PSYCHIATRIC CONTRAINDICATIONS
1	2
Lead and inorganic compounds thereof	Smelting lead from ore and concentrates; recovery of lead-containing alloys; refinement; recovery of dry lead-containing pigments, bleaches, chrome pigments; Schoop spraying with lead in closed areas, rolling, pressing, coating items with lead; mechanical and manual processing of lead; sintering; casting bearings; production of lead batteries; annealing in lead baths; production of ground lead-containing paint, glaze and enamel; straightening with lead-containing compounds; production and processing of lead-containing glass and fiberglass, welding and cutting surfaces covered with lead-containing ground; painting work with constant use of lead paints; production of lead items. Production and use of piezoceramic and glass-ceramic cement. Concentration of lead ore; pulverization, mixing and other processes related to formation of dust containing lead sulfide; work related to decentralized melting of small amounts of lead, soldering, printing industry (linotype work, manual type-setting, and others)
Selenium, tellurium and compounds thereof	Production and use
Sulfur and compounds thereof	Production and use of organosulfur compounds, sulfanate additives, methyl sulfide compounds, sulfurous and sulfuric acids, processes related to recovery of sulfurous and sulfuric anhydride, hydrogen sulfide
Hydrogen sulfide	Production and use; processes related to recovery thereof
Cyanide compounds	Production and use
Hydrocyanic acid, compounds thereof, cyanamides and others	Same
Synthetic rubber	Production of synthetic rubber and processing thereof (preparation of rubber stock, rubber vulcanization)
Synthetic detergents A	Production of sulfanol, alkylamides, sodium sulfate; chlorination of fraction of paraffin hydrocarbons and others
Synthetic resins and plastics based on:	
—styrene	Production of polymers and copolymers of styrene, polyester resins, varnishes and adhesives on their basis, fiber glass, and others. Processing resins and plastics. Use of resins, varnishes, adhesives
—phenol and formaldehyde A	Production of resins, varnishes, adhesives and others, processing molding powders, molding materials. Use of adhesives, varnishes, impregnating, compounds, binders and others
—silicone compounds	Production of resins, varnishes, liquid silicones, processing polymers, molding materials, use of varnishes, lubricants, resins and others
—isocyanates A	Production of polyurethanes, foam polyurethanes, polyurea and others, processing and use
—organofluoric compounds	Production of polymers (fluoroplastics) and copolymers; heat and mechanical processing of fluoroplastics
—vinyl chloride and vinylidene chloride	Production of polymers and copolymers, perchlorovinyl, adhesives, varnishes and others; processing resins and plastics, and use of adhesives, varnishes and others
acrylic and methacrylic acids A	Production and processing of polymers, copolymers, use of emulsions, varnishes, paint and others
—amino acids, dibasic acids, diamines A	Production and processing of polyamides; use of adhesives and others
—epichlorohydrin A	Production and use of epoxy resins and plastics based on them, compounds
—aliphatic and unsaturated hydrocarbons (polyethylene, polypropylene)	Production and processing of polymers and copolymers
Shale tars A	Production and use; industries related to extraction thereof
Antimony and compounds thereof	Recovery, processing and use
Thallium and compounds thereof	Production and use; monocrystal growing
Tetraethyl lead	Production of tetraethyl led and ethylating liquid, mixing ethylating liquid with fuel. Use of ethylated gasoline; testing, repair, disassembly and cleaning of aircraft and motor vehicle engines, refueling aircraft and other machines, draining, pouring ethylated gasoline at manually operated stations, cleaning installations and containers at bulk oil plants, gasoline storage tanks, gasoline pumps
Metals A:	
—cobalt, vanadium	Recovery and use of cobalt and compounds thereof

Hazardous and deleterious substances and industrial factors (A denotes allergens)	Jobs. ADDITIONAL MEDICAL PSYCHIATRIC CONTRAINDICATIONS
1	2
—molybdenum, titanium, zirconium, tungsten and compounds thereof	Recovery of vanadium pentoxide; production of ferrovanadium, processing vanadium-containing slag; Production and use of molybdenum, tungsten and compounds thereof; processing titanium, reduction of metal titanium and compounds thereof; recovery and use of tungsten-cobalt alloys, titanium-cobalt alloys, molding powders with zirconium and compounds thereof
Ursol, ursol dyes and oxidizable dyes A	Production and use; fur dyeing
Pharmacological agents	Production and preparation of ready-made medicinal forms of morphine and its derivatives, vitamins, sulfanilamide, pyrazolone, antineoplastic and hormonal agents, neuroleptics, anticoagulants, anesthetics (halothane), use in anesthesiological practice; preparation of drugs in pharmacies, use of neuroleptics in psychiatric practice ADDITIONAL CONTRAINDICATIONS: ALCOHOLISM, TOXIC AND NARCOTIC SUBSTANCE ADDICTION
Phenols and derivatives thereof	Production and use
Formaldehyde A and other aldehydes of the fatty series	Production and use; processes related to their recovery
Phosphorus and compounds thereof	Production and use of yellow phosphorus, compounds thereof, organophosphorus compounds, including plasticizers. Production and use of red phosphorus; recovery, production and use of phosphates
Phthalic acid, phthalic anhydride and derivatives thereof	Production and use
Fluorine and compounds thereof	Production and use of fluorine and compounds thereof. Electrolytic recovery of aluminum, recovery and use of fluorspar, processes involving recovery of fluorine and compounds thereof
Furans and derivatives thereof, furfurol, tetrahydrofuran and others	Production and use
Chlorine and compounds thereof, chlorine-containing mixtures	Production and use; processes related to their recovery
Chloronaphthalene and compounds thereof (halovax, chloronaphthalenes A and compounds thereof, hydroxynaphthalene and naphthol	Production and use
Chromium A, chromous acid A, compounds and alloys thereof	Production and use (including substances containing chromium compounds as secondary constituents)
Biological	
Antibiotics A	Production and use in medical practice and pharmacies
Productive fungi, protein-vitamin concentrates (PVK), feed yeast, mixed feed A	Production and use of products of microbiological synthesis
Enzyme preparations, biostimulators A	Production and use in medical practice, pharmacies, agriculture and other sectors of the national economy
Allergens, diagnostic and therapeutic; blood preparations A, immunobiological preparations	Production
Infected material and helminth-contaminated material	Work in contact with infected and helminth-contaminated material, with infectious patients
Brucellosis pathogens	Livestock farms (regardless of epizootic condition for brucellosis), enterprises processing raw materials and products of animal origin
Q fever pathogen	Livestock farms in territories with Q fever problem, enterprises processing raw materials and products from livestock stricken with Q fever
Industrial Aerosols	
Abrasive and abrasive-containing substances	Production, processing and use of abrasives (synthetic corundum—aluminum-oxide abrasive, white, chromous, monocorundum), carbide, boron, L-boron, processing and use of silicon carbide and others
Silicon-containing (free and amorphous silicon dioxide)	Prospecting, tunneling work, open and subterranean extraction of ore and adjacent minerals, coal, concentration and processing thereof. Production of silicon, glass, dinas [silica brick], aerosil [silica powder], silicon carbide, silicon-copper alloy, silumin and others; foundry work (earth preparation, casting, stamping, trimming, scraping, cleaning cast). Sandblasting
Metals and alloys thereof	Dry polishing of metal sand alloys; processes of spray-coating metals, producing metal powders and items made with them
Silicates and silicate-containing:	

Hazardous and deleterious substances and industrial factors (A denotes allergens)	Jobs. ADDITIONAL MEDICAL PSYCHIATRIC CONTRAINDICATIONS
1	2
a) asbestos-containing (10 percent or more asbestos)	Prospecting, mining and processing asbestos ore and asbestos. Production and processing of synthetic asbestos
b) asbestos-containing (no more than 10 percent asbestos)	Production, processing items made of asbestos cement, asbestos bakelite, fiber, asbestos rubber
c) other silicates and silicate-containing substances	Production and processing of glass and mineral fiber, cement, clay, fireclay, naphthalene syenites, disthene-sillimanite, olivine, apatites, mica, dunite, chrome magnesite, forsterite, limestone, barite, "kotlenit," diatomaceous earth, tuffals, pumice, pearlite, iron-ore concentrates and agglomerate in metallurgy and others
Carbons	Extraction, processing and use of coal. Production and use of carbon black, synthetic graphite, coke (oil, pitch, shale and others). Processing and use of natural and artificial diamonds
Dust of plant and animal origin	Processing cotton, flax, hemp, wool, ambary, jute, peat, hops. Production of paper, natural silk and other materials
Dust from inorganic luminophores (including those containing less than 5% cadmium)	Production and use
Welding aerosols	
a) containing manganese (20% or more), nickel, chromium, fluorine compounds, beryllium, lead	Arc-plasma, gas-flame welding, fusingand cutting, contact end-to-end welding (by flashing), electroslag welding of metals. Welding, fusing and cutting of medium- and high-alloy, including stainless, steel, welding and fusing nickel or copper-nickel electrodes and wires on pig iron, welding and cutting beryllium and alloys thereof
b)containing manganese (up to 20%), ferric oxides, aluminum, magnesium, titanium, copper, zinc, molybdenum, vanadium, tungsten	Welding, fusing and cutting carbon, including zinc-coated steel, aluminum, copper, titanium and alloys based on them, welding and fusing pig iron with iron and iron-vanadium electrodes and wires, cutting pig iron
Physical	
Ionizing radiation. Radioactive sources and sources of ionizing radiation	All types of work with radioactive substances and sources of ionizing radiation
Nonionizing radiation:	
—laser radiation	All types of work with lasers
—electromagnetic (electric and magnetic) radiofrequency fields in the range of 30 MHz-300GHz (VHF, UHF, SHF, EHF) and below 30 MHz (HF, MF, VLF, ILF, ELF, F infrasonic, hypo-low frequency)	All types of work with sources of electromagnetic energy in the indicated ranges
—steady electric and direct magnetic fields	All types of work with sources of direct electric and steady magnetic fields
Industrial vibration	All types of work involving exposure to local or general vibration
Industrial noise	All types of work involving exposure to intense industrial noise, as well as considerable strain on the acoustic analyzer, 81 dB and higher
Ultrasound (contact transmission)	Work with ultrasonic flaw detectors and medical equipment
High atmospheric pressure	Work in caissons, pressure chambers, diving work
Low temperature	Work at constantly low ambient temperature in work zone of industrial premises (below permissible levels according to Sanitary standards for microclimate of industrial premises approved by the USSR Ministry of Health)
High temperature, intense heat emission	All types of work with constant exposure to high temperature (exceeding permissible level according to Sanitary standards for microclimate of industrial premises approved by the USSR Ministry of Health) and intense heat emission (over 140 Wt/m^2) in the work zone
Increased eye strain	All types of work involving increased eye strain: a) Class I precision work (with objects up to 0.15 mm), according to 1980 SNIP [construction standards and regulations], and II (with 0.15-0.3 mm objects); b) classes III and IV precision work (0.5-1 mm objects) according to SNIP, and work which involves tracking screen displays and other means of displaying information

Hazardous and deleterious substances and industrial factors (A denotes allergens)	Jobs. ADDITIONAL MEDICAL PSYCHIATRIC CONTRAINDICATIONS
1	2
Physical overexertion	Work involving manual handling of heavy items (item in kg) or exertion (in N; 1 N = 0.1 kgf) during a shift (for men): more than 30 kg (or more than 300 N) when done continuously; weight moved or lifted manually per shift (weight turnover per shift)—more than 12 t, when lifting from the floor or a level considerably lower than working surface—more than 5 t. Work related to maintaining a constrained position for a long time, including standing. Work involving local muscular tension, mainly of wrist and arm muscles. Periodically holding up and object weighing more than 10 kg with both hands or more than 5 kg with one hand kg (for men). Work involving periodic marked inclination of the body (visual estimate of more than 30° from the vertical line) more than 300 times per shift; assuming a constrained working position (on one's knees, stooped, lying down, bending forward, in a sling, standing) for more than 50% of the shift. Work involving vocal strain: instructors, speaking, vocal-speaking types of acting, work at a central telephone office

Medical psychiatric contraindications for some forms of professional activities involving increased hazard Chronic and protracted mental disorders with severe, persistent or frequently exacerbated pathological manifestations, epilepsy with paroxysmal disorders constitute general medical psychiatric contraindications for the types of work and occupations listed in the table. Marked borderline mental disorders are discussed on an individual basis in each case. Additional contraindications and tests are listed in Column 2. Certification must be repeated at least once every five years. General laboratory and functional tests; electroencephalography.

Work, types of professional activities, and job categories	Additional medical psychiatric contraindications. ADDITIONAL TESTS
1	2
Work in high places, work of steeplejacks, and work involving hoisting, as well as work related to servicing scaffolding	Epilepsy and syncopic states. ELECTROCARDIOGRAPHY
Personnel who service working 127-V or higher voltage electric installations, perform ongoing commutation operations, adjust, assemble and carry out high-voltage testing at such electrical installations	Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addiction (on an individual basis). ELECTROCARDIOGRAPHY
Work in the State Forest Conservation system: felling, rafting timber and primary timber processing	Epilepsy and syncopic states. ELECTROCARDIOGRAPHY
Work in remote regions and underground:	Epilepsy and syncopic states. ELECTROCARDIOGRAPHY
—work in the oil and gas industries, including use of "on watch" method, in the Extreme North and regions equated to it, desert and other regions that are remote or sparsely inhabited, as well as underwater drilling; all forms of work underground; work at hydrometeorological stations, communication installations situated in desert, tayga and other remote and sparsely populated regions, under difficult climate and geographic conditions; geological prospecting, topographic, building and other work in remote, little-populated, inaccessible, tundra, swampy and mountain regions of the nation (including use of the expedition-watch method); work dealing with organizing recruiting and public appeals for the Extreme North and regions equated to it	
Instrument technicians servicing pressurized containers	Epilepsy (on an individual basis)
Machine operators (stokers), boiler room operators, workers in gas oversight service,	Epilepsy and syncopic states. ELECTROCARDIOGRAPHY
Work involving use of explosives, work in explosion- and fire-hazard industries	Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addiction. ELECTROCARDIOGRAPHY
Workers in the armed guard and armored vehicle services of the cash collection and delivery system of the Russian Federation Central Bank and other departments and services which are allowed to carry and use firearms (employees of the Internal Security Troops of the Republic of the Ministry of Transportation undergo pre-employment and subsequent regular physicals in accordance with Order No 23Ts of the USSR Ministry of Railways dated 7 Jul 87)	Alcoholism, drug and toxic substance addiction. Epilepsy (on an individual basis)
Gas rescue service, volunteer gas rescue teams, armed units and detachments for prevention and eradication of open gas and oil gushers, armed mountain and mountain rescue units, fire units, emergency medical care service, specialized medical brigades in constant readiness	Mental illness (including remissions). Alcoholism, narcotic and toxic substance addiction. Epilepsy and syncopic states. ELECTROCARDIOGRAPHY
Work on turning lathes, milling machines, other lathes and machines, punch presses	ELECTROCARDIOGRAPHY
Work directly involved with vehicular, including intraplant, traffic	Epilepsy and syncopic states. ELECTROCARDIOGRAPHY

Work, types of professional activities, and job categories	Additional medical psychiatric contraindications. ADDITIONAL TESTS
1	2
Operators of motor, truck and municipal electric vehicles, including operators of:	
—all types and makes (Category A) of motorcycles, motor scooters, snowmobiles; minitractors and motorized lifts (who have undergone registration with the State Motor Vehicle Inspectorate), motor vehicles with manual controls for all categories of invalids (disabled veterans of the Great Patriotic War and others in the military service, work-related invalids and invalids since childhood);	Borderline mental retardation and retarded mental development (on an individual basis, recertification in 3 years). Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addiction (allowed if there is persistent remission). ELECTROCARDIOGRAPHY. EXPERIMENTAL PSYCHOLOGICAL TESTING
—all types and makes (Category A) of mopeds;	Epilepsy and diseases associated with narcoleptic and cataleptic episodes. Syncopic states. Disability-group-classified mental illness, and other cases on an individual basis. Alcoholism, toxic and narcotic substance addiction (allowed if there is persistent remission). ELECTROCARDIOGRAPHY. EXPERIMENTAL PSYCHOLOGICAL TESTING
—motor vehicles weighing no more than 3500 kg, with driver's and 8 passenger seats (Category B), with the right to work for hire, operate tractors and other motorized vehicles;	Borderline mental retardation and retarded mental development (on an individual basis, recertification in 3 years). Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addiction (allowed if there is persistent remission after specialized treatment; in the absence of personality deterioration and somatoneurological disorders, the question of permission to work is decided on an individual basis upon submitting a favorable reference and petition from the employer and information about behavior from internal affairs agencies near place of residence. Narcotic and toxic substance addicts are allowed to work if there has been a persistent remission for at least 3 years). ELECTROCARDIOGRAPHY. EXPERIMENTAL PSYCHOLOGICAL TESTING
—motor vehicles weighing no more than 3500 kg, with driver's and 8 passenger seats (Category B), without right to work for hire;	Borderline mental retardation and retarded mental development (on an individual basis, recertification in 3 years). Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addiction (allowed if there is persistent remission). ELECTROCARDIOGRAPHY. EXPERIMENTAL PSYCHOLOGICAL TESTING
—trucks designed to carry loads weighing more than 3500 kg (Category C);	Borderline mental retardation and retarded mental development (on an individual basis, recertification in 3 years). Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addiction (allowed if there is persistent remission after specialized treatment; in the absence of personality deterioration and somatoneurological disorders, the question of permission to work is decided on an individual basis upon submitting a favorable reference and petition from the employer and information about behavior from internal affairs agencies near place of residence. Narcotic and toxic substance addicts are allowed to work if there has been a persistent remission for at least 3 years). ELECTROCARDIOGRAPHY. EXPERIMENTAL PSYCHOLOGICAL TESTING
—vehicles designed to transport passengers with more than 8 passenger seats, in addition to driver's (category D), tractor-trailers in vehicle categories B, C or D (Category E);	Borderline mental states and retarded mental development. Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addition. Speech defects and severe stuttering (on an individual basis). ELECTROCARDIOGRAPHY. EXPERIMENTAL PSYCHOLOGICAL TESTING
trolleys, trolley buses;	Borderline mental states and retarded mental development. Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addiction. Speech defects and severe stuttering (on an individual basis). ELECTROCARDIOGRAPHY. EXPERIMENTAL PSYCHOLOGICAL TESTING
motorized wheelchairs	Borderline mental states and retarded mental development (on an individual basis, recertification in 3 years). Epilepsy and syncopic states. Alcoholism, narcotic and toxic substance addiction (on an individual basis). ELECTROCARDIOGRAPHY. EXPERIMENTAL PSYCHOLOGICAL TESTING
Other types of professional activities and job categories:	
—employees of food industry enterprises, public catering services and trade, dairy farms, dairy kitchens; food distribution centers, bases and warehouses, who come in contact with foodstuffs in production, storage and sales, including those involved in sanitary treatment and repair of stock, equipment, as well as individuals in direct contact with foods while being carried in all types of transportation;	

Work, types of professional activities, and job categories	Additional medical psychiatric contraindications. ADDITIONAL TESTS
1	2
students at technical schools, schools, general education schools, VUZs [higher educational institutions] before and during on-the-job training in enterprises, institutions and organizations, whose employees are subject to medical psychiatric certification;	
health care workers in surgical hospitals, maternity homes (departments), pediatric hospitals (departments), departments of neonate and premature infant pathology;	Epilepsy (on an individual basis)
employees of educational institutions;	
employees of children's and adolescents' health-improving facilities, including seasonal ones	
employees of preschool institutions, child centers, homes for children, boarding schools, school boarding houses;	
workers in medical-preventive [therapeutic and preventive care] institutions, sanatoriums, rest homes, boarding houses, boarding schools, who are directly involved in organizing patient nutrition;	
workers in enterprises of sanitary and hygienic services to the public (bath-house, shower-room employees, hairdressers, manicurists, pedicurists, cosmeticians, ancillary personnel of laundries, laundry-receiving centers, dry-cleaning establishments);	
swimming trainers and instructors, swimming-pool and therapeutic bath employees who administer treatment;	Epilepsy and syncopic states. ELECTROCARDIOGRAPHY
service personnel of hotels, dormitories, conductors aboard long-distance passenger trains; employees of water-supply installations directly involved in treating water, and individuals who service the water-supply system;	
workers at livestock farms and complexes.	

Notes: 1. All categories of invalids undergo certification by expert medical industrial commissions in order to determine medical psychiatric contraindications to operation of vehicles.
2. Psychiatric certification of workers servicing commercial rail (including underground trains) and aircraft traffic is carried out inaccordance with the list of industries and occupations approved by the Russian Ministry of Railroads and Russian Ministry of Transportation in agreement with the Russian Ministry of Health and Russian Ministry of Labor.
3. Work in high places refers to work performed at a height of 1.5 m or more above ground or floor level, carried out with scaffolding or directly with construction elements, equipment, machinery and mechanisms to install, operate, assemble and repair them.

Steeplejack work refers to work in which the principal means of protection against falling is a sling worn for all work and movement.

4. If there are epidemiological indications in a region, public health agencies, by agreement with relevant labor services and occupation of the public, may augment the list of enterprises and occupations, as well as alter the scope and frequency of psychiatric certification.
5. Employees of institutions rendering psychiatric care undergo psychiatric certification in accordance with the rules for employment and operation of said institutions.

Fundamentals of Ukrainian Health Law

Fundamentals of Health Care Legislation of the Ukraine

937C0407B Kiev GOLOS UKRAINY in Russian 15 Dec 92 pp 9-13

[Law on "Fundamentals of Health Care Legislation of the Ukraine," signed by L. Kravchuk, Ukrainian president, on 19 Nov 92]

[Text]Each person has the natural, inalienable and inviolable right to health care. Society and the government are responsible to present and future generations for their health and preservation of the gene pool of the Ukrainian people, they provide for priority of health care in activities of the State, improvement of working, educational, living and recreational conditions for the public, solutions of ecological problems, improvement of medical care and adoption of a healthy lifestyle.

The Fundamentals of Health Care Legislation in the Ukraine regulate social relations in this field for the purpose of assuring harmonious development of physical and spiritual strength, high degree of work fitness and long active life for the people, elimination of factors having a deleterious effect on their health, prevention and lowering morbidity, disability and mortality, improvement of heredity.

Section I. General Statutes

Article 1. Ukrainian health care legislation

Ukrainian health care legislation is based on the Ukrainian Constitution and consists of these Fundamentals and other legislative acts approved in accordance with the former, which regulate social relations in the field of health care.

Article 2. International agreements of the Ukraine in the field of health care

If international agreements involving the Ukraine set rules other than those provided by Ukrainian health care legislation, the rules in the international agreement apply.

Article 3. Concepts and terminology used in health care legislation

In these Fundamentals and other health care legislative acts, the main concepts have the following meaning: health: a state of complete physical, emotional and social well-being, rather than solely the absence of diseases and physical defects; health care: a system of measures aimed at assuring preservation and development of an individual's physiological and psychological functions, optimum fitness for work and social activities with maximum, biologically possible individual life span;health care institutions: enterprises, institutions and organizations whose task is to meet the diverse needs of the people in the field of health care, by means of rendering medical-sanitary care, including a broad spectrum of preventive and therapeutic measures or medical services, as well as to perform other functions on the basis of professional activities of medical workers; medicosanitary care: a set of special measures directed toward helping improve health, broaden knowledge about sanitation, prevention of diseases and disability, early detection of disease, aid to individuals with acute and chronic diseases, rehabilitation of the sick and disabled.

The content of other concepts and terminology is defined by Ukrainian legislation in special glossaries of concepts and terms of the World Health Organization.

Article 4. Basic principles of health care

The basic principles of Ukrainian public health are: recognition of health care as the priority direction of activities of society and the State, one of the chief factors in survival and development of the Ukrainian people; adherence to human and citizen rights and freedoms in the field of health care and provision of related State guarantees; humanistic orientation, priority of general human values over class, ethnic, group or individual interests, increased sociomedical protection of the most vulnerable strata of the population; equal rights of citizens, democracy and accessibility to all of medical care and other services in the field of health care; material-technical and financial support must conform, with scientific validation, to the objectives and level of socio-economic and cultural development of society; direction toward modern health standards and medical care, combining national traditions and achievements with world-wide knowhow in the field of health care; preventive-prophylactic set of social, ecological and medical approaches to health care; mixed health care economics and multichannel funding thereof, combining State guarantees with demonopolization and incentives for entrepreneurism and competition; decentralization of State administration, development of self-administration of institutions and independence of health care workers on a legal and contractual basis.

Article 5. Health care as the mutual obligation of society and State

State, social and other agencies, enterprises, institutions, organizations, officials and citizens must provide for priority of health care in their own work, without causing harm to health of the public and individual people, to provide within the limits of their competence care for patients, invalids and victims of accidents, cooperate with workers in health care agencies and institutions, as well as perform other duties as provided by health care legislation.

Section II. Citizen Rights and Duties in the Field of Health Care

Article 6. The right to health care

Each Ukrainian citizen has the right to health care, which provides: a) a standard of level, including food, clothing, housing, medical care and social services and security, necessary to maintain health; b) an environment that is safe to life and health; c) sanitary-epidemic welfare of the territory and population center where the individual resides; d) safe and healthy working, schooling, living and recreational conditions; e) qualified medicosanitary aid, including free choice of physician and health care institution; f) reliable and prompt reporting about the health of the individual and health of the people, including existing and potential risk factors, and severity thereof; g) participation in discussion of drafts of legislative acts and offering suggestions on shaping State policy in the field of health care; h) participation in health care administration and social expertise on these matters according to procedure stipulated by legislation; i) opportunity to form social organizations for the purpose of cooperating in health care; j) legal protection against all illegal forms of discrimination related to health status; k) compensation for harm done to health; l) complaints about illegal decisions and actions of health care workers, institutions and agencies; m) opportunity to obtain an independent expert medical opinion expertise in case of the citizen's disagreement with conclusions of State medical experts, being submitted to forced treatment, and in other cases if the actions of health care workers could infringe upon universally recognized human and citizen rights.

Ukrainian legislation can also define other citizen rights in the field of health care.

Ukrainian citizens abroad are guaranteed the right to health care in the forms and scope provided by international agreements, in which the Ukraine is a participant.

Article 7. Guarantee of right to health care

In accordance with the Ukrainian Constitution, the State guarantees to all citizens the expression of their rights in the field of health care by means of: a) creation of a branched out network of health care institutions; b)

organization and implementation of a system of State and social steps to safeguard and strengthen health; c) delivery to all citizens of a guaranteed level of medicosanitary care to the extent established by the Ukrainian Cabinet of Ministers; d) implementation of a State system of gathering, processing and analyzing social, ecological and special medical statistical data; e) establishment of liability for violating rules and legal interests of citizens in the field of health care.

Article 8. State protection of rights to health care

The state recognizes the right of each Ukrainian citizen to health care and health protection.

In the event that legal rights and interests of citizens in the field of health care are violated, pertinent State, social or other agencies, enterprises, institutions and organizations, their executives and citizens must take steps to restore violated rights, protect legal interests and make restitution for damage caused.

Protection of the right to health care in legal form is implemented according to procedure established by legislation.

Article 9. Limitations on citizen rights related to health status

On the basis of and following procedure stipulated by Ukrainian laws, citizens may be declared temporarily or permanently unfit because of health for professional or other activities related to increased danger to others, as well as to performance of specific State functions.

Use of forced medical measures on individuals who have committed socially dangerous acts, limitation of the rights of other citizens in the form of forced medical examination or forced hospitalization, as well as in connection with quarantine measures, are allowed only on the basis of and following procedure stipulated by Ukrainian laws.

Decisions on limiting citizen rights related to their health status may be appealed in legal form.

Article 10. Duties of citizens in the field of health care

Ukrainian citizens are obliged to: a) be concerned about their health and the health of children, and not harm the health of other citizens; b) undergo preventive medical examinations and receive inoculations in cases stipulated in legislation; c) give emergency aid to other citizens who are in life and health threatening states; d) perform other duties stipulated in health care legislation.

Article 11. Rights and duties of foreign citizens and stateless individuals

Foreign citizens and stateless individuals residing on Ukrainian territory enjoy the same rights and have the same obligations in the field of health care as Ukrainian citizens, unless otherwise stipulated in international agreements or Ukrainian legislation.

The rights and duties in the the field of health care of foreign citizens and stateless individuals who are temporarily on Ukrainian territory are defined by legislation and pertinent international agreements.

Section III. Bases for Organization of Health Care

Article 12. Health care, the priority direction of State activities

Health care is one of the priority directions of State activities. The State shapes health care policy in the Ukraine and provides for its implementation.

State health care policy is funded by budgetary allocations in an amount conforming to its scientifically validated needs, but no less than ten percent of the national income.

Article 13. Shaping State health care policy

The Ukrainian Supreme Soviet lays the foundation for State health care policy by means of securing constitutional and legal aspects of health care, defining its goals, main tasks, directions, principles and priorities, establishing norms and scope of budgetary funding, creating systems conforming to credit and finance, tax, customs duty and other regulators, and approving the list of comprehensive and special-purpose national health care programs.

In order to solve problems of shaping State health care policy, consultant and expert offices manned by health care specialists and representatives of the community may be formed under the Supreme Soviet of the Ukraine. The procedure for establishing and activities of such agencies are stipulated by the Ukrainian Supreme Soviet.

The health care policy of the Republic of Crimea, local and regional comprehensive and special-purpose programs, which are prepared by the Supreme Soviet of the Crimean Republic, local and regional self-government agencies constitute an integral part of the State health care policy of the Ukraine, and they reflect the specific health care needs of the population of pertinent territories.

Article 14. Implementation of the State health care policy

Implementation of the State health care policy is delegated to of State executive agencies.

The president of the Ukraine is personally responsible for it. In his annual report to the Ukrainian Supreme Soviet, the Ukrainian president reports on the status of implementation of State health care policy.

The Ukrainian president is the guarantor of citizen rights to health care, implements adherence to health care legislation through a system of State executive agencies; he carries out State health care policy and exercises other powers stipulated in the Ukrainian Constitution.

The Ukrainian Cabinet of Ministers organizes elaboration and implementation of comprehensive and special-purpose national programs; he creates economic, legal and organizational systems to stimulate efficient performance in the field of health care; he implements development of a network of health care institutions; he signs intergovernment agreements and coordinates international collaboration on health care issues, and also exercises, within the limits of his competence, other powers placed upon State executive agencies in the field of health care.

Within the limits of their competence, ministries, departments and other central State executive agencies develop programs and forecasts in the field of health care, define unified, scientifically validated State standards, criteria and requirements which should assist in health care for the public; they prepare and place State orders for material and technical support of this sector; they implement State supervision and oversight, and other executive-management activities in the field of health care.

The Crimean Council of Ministers, representatives of the Ukrainian president and subordinated local state administration agencies, as well as executive committees of rural, village and urban councils of people's deputies implement State health care policy within the limits of their authority, as stipulated in legislation.

Article 15. Health care agencies

The Ukrainian Ministry of Health, whose competence is defined in a statute approved by the Ukrainian Cabinet of Ministers, is the specially authorized central agency of State executive power in the field of health care.

The duties of specially authorized State executive agencies in territorial-administrative entities of the Ukraine are delegated to the Health Department of the Crimean Council of Ministers and local State administrative agencies.

Article 16. Health care institutions

Sanitary-preventive, medical-preventive [therapeutic and preventive care] therapeutic physical culture, sanatorium and resort, pharmacy, medical research and other health care institutions are directly involved in public health care.

Health care institutions are established by enterprises, institutions and organizations with different forms of ownership, as well as private individuals, in the presence of the necessary material and technical base, and qualified specialists. Procedure and conditions for establishment of health care institutions, State registration and accreditation of such institutions, as well as procedure for licensing medical and pharmaceutical practice are stipulated in Ukrainian legislative acts.

The health care institution performs its activities on the basis of a charter approved by the proprietor or his authorized agency.

Regardless of juridical status of a health care institution, it can be managed only by an individual that meets the State-established unified qualification requirements. Independence in making decisions on all issues related to health care must be granted to the administrator of a health care institutions.

The Ukrainian Cabinet of Ministers and its authorized agencies, as well as local self-government agencies within the limits of their authority, have the right to suspend the activities of any health care institution, if it violates health care legislation, fails to meet State requirements as to quality of medical care and other activities in the field of health care, or if its actions are in contradiction to its charter.

Article 17. Individual entrepreneurial health care activities

The State supports and encourages individual enterpreneurial activities in the field of health care.

A permit (license) for such activities is issued following procedure stipulated in legislation. Disputes concerning denial of permit (license) are examined in legal form.

Engagement in medical and pharmaceutical practice without the appropriate license is subject to liability as stipulated in legislation.

Article 18. Health care funding

Health care is funded by the Ukrainian State budget, Crimean budget, local and regional self-government budgets, health insurance funds, charitable funds and any other sources that are not prohibited by legislation.

Funds from the Ukrainian State budget, Crimean budget, local and regional self-government budgets, which are allocated for health care, are used to provide the public with a guaranteed level of medicosanitary aid, funding State and local health care programs and basic research on these matters.

The extent of budgetary funding is determined on the basis of scientifically validated norms per capita.

The Ukrainian State budget, Crimean budget, local and regional self-government budgets fund health care institutions accessible to all. Funds that have not been used by a health care institution are not returnable and are not deducted from funding for the next period.

Departmental and other health care institutions servicing only some population categories according to occupation, department or other factor unrelated to the health status of an individual are funded, as a rule, by the enterprises, institutions and organizations that they service. It is allowed to give financial support to such institutions at the expense of the State or local budgets if

workers of the pertinent department, enterprise, institution or organization constitute a significant part of the inhabitants of a given locality.

All health care institutions have the right to use resources, to enhance the quality of their work, given voluntarily by enterprises, institutions, organizations and individual citizens, as well as to fix payments for health care services with the permission of a proprietor or his authorized agency.

The State provides for establishment and operation of a system of health insurance for the public. Ukrainian State budget, funds of enterprises, institutions and organizations and citizens' contributions pay for this insurance. Matters of organization of health insurance and use of insurance funds are stipulated in pertinent legislation.

Article 19. Material and technical support of health care

The State organizes material and technical support of health care to the extent necessary to provide the public with a guaranteed level of medico-sanitary aid. All health care institutions have the right to make independent decisions on matters of their material and technical support. The State assists in production of medical apparatus, instruments, equipment, laboratory reagents, drugs, prostheses, hygienic supplies and other items necessary to health care, as well as development of trade in such goods.

For this purpose, there are provisions for implementation of State programs of priority development of the medical, biological and pharmaceutical industries, it encourages entrepreneurism and international collaboration in the area of material and technical support of health care, creates a system of relevant taxation, prices, customs and other preferential treatment and regulators.

The State can restrict export of merchandise essential to health care and raw materials to manufacture it, if it could be detrimental to the health care interests of the Ukrainian people.

In order to provide for proper quality of goods needed for health care, their use is permitted only after mandatory trial carried out following procedure coordinated with the Ukrainian Ministry of Health.

Article 20. Scientific support of health care

The state assists in development of research in the field of health care and adoption of its results in the practice of health care institutions and workers. Research carried out by academic and departmental research institutions, educational and other scientific institutions and subdivisions or individual scientists is funded on the basis of competition by the State budget, as well as any other sources of financing that are not in contradiction with legislation.

All State health care programs and most important measures for their implementation are subject to mandatory prior scientific expertise in the leading national and international institutions named by the Ukrainian Cabinet of Ministers.

The Ukrainian Academy of Medical Sciences, which is independent in carrying out research and development, is the highest scientific medical institution of the Ukraine with the status of a self-administered organization.

Article 21. Tax-related and other preferential treatment in the field of health care

Health care institutions and individuals engaged in enterpreneurial health care, as well as business entities that produce items necessary to support the activities of health care institutions enjoy tax-related or other preferential treatment as stipulated in legislation.

Article 22. State monitoring and oversight in the field of health care

Through specially authorized executive agencies, the State monitors and oversees adherence to health care legislation, State standards, criteria and requirements aimed at providing a healthy environment and sanitary-epidemic well-being of the public, norms of professional activities in the field of health care, requirements of the State Pharmacopoeia, standards of medical services, medical materials and equipment.

Article 23. Higher oversight of adherence to health care legislation

Higher oversight of adherence to health care legislation is implemented by the Prosecutor-General of the Ukraine and his subordinate prosecutors.

Article 24. Community participation in health care

Health care agencies and institutions must assist in implementation of citizen rights to participate in health care management and public expertise on these matters.

Public consultant or oversight councils may be formed in health care agencies and institutions, to assist in their work and inform the public, and effect public monitoring in the field of health care.

Professional societies of health care workers and other associations of citizens, including international ones, may participate in defining the content and means of implementation of national and local health care programs, pertinent measures, decisions on personnel, scientific and other problems of organizing State activities in this field.

Section IV. Providing Healthy and Safe Living Conditions

Article 25. Maintenance of public standard of living essential to health

The State provides a standard of living, including food, clothing, housing, medical care, social services and security that is essential to maintain the health of the people.

For these purposes, on the basis of scientifically validated medical, physiological and sanitary-hygienic requirements, unified rates are fixed for minimum wages, pensions, scholarships, social benefits and other incomes of the public, in-kind, including free, supply of food, clothing, drugs and other essential items is organized for the most vulnerable strata of the population; a set of measures is carried out to meet essential needs of refugees, homeless and other individuals who have no definite place of residence; free medical care and social services are provided for individuals who are in difficult financial straits presenting a threat to their lives and health.

Medical, physiological and sanitary-hygienic requirements pertaining to standard of living are approved by the Ukrainian Supreme Soviet.

Article 26. Environmental protection

The State provides for environmental protection as an important prerequisite of human life and health, by means of protecting animate and inanimate nature, protecting people against negative ecological factors, achieving harmonious interaction of individuals, society and nature, wise use and reproduction of natural resources.

Relations pertaining to environmental protection are regulated by pertinent legislation of the Ukraine and international agreements.

Article 27. Providing sanitary-epidemic welfare of territories and population centers

Sanitary-epidemic welfare of territories and population centers is provided by a system of State incentives and regulators aimed at strict adherence to sanitary-hygienic and sanitary-epidemic-control rules and standards, a system of special sanitary-hygienic and sanitary-epidemic-control measures and organizations of State sanitary oversight.

In the Ukraine, unified sanitary-hygienic requirements are established for: planning and construction of population centers; construction and operation of industrial and other entities; purification and decontamination of industrial and municipal emissions, garbage and waste; upkeep and use of residential, industrial and business buildings and territories where they are located; organization of public catering facilities and water supply; production, use, storage, transportation and burial of radioactive, toxic and potent substances; upkeep and slaughtering of domestic and wild animals, as well as for other activities that could endanger sanitary-epidemic welfare of territories and population centers.

Article 28. Providing beneficial working, educational, living and recreational conditions

Unified sanitary-hygienic requirements are established for the organization of industrial and other processes related to human activities, as well as for the quality of machinery, equipment, structures, consumer goods and other things that could have a deleterious effect on health, in order to provide working, educational, living and recreational conditions that are beneficial to health, a high level of work fitness, to prevent traumatism and occupational disease, poisoning and other possible harm to health. All State standards, specifications and industrial prototypes must be in agreement with health care agencies following procedure established by legislation.

Proprietors and administrators of enterprises, institutions and organizations must provide in their work for adherence to labor safety rules, industrial sanitation and other labor safety requirements, as stipulated in labor legislation, and must not allow any factors that are deleterious to human health and the environment.

The State implements oversight and monitoring of creation of working, educational, living and recreational conditions beneficial to health, and cooperate in public monitoring of these matters.

Article 29. Preservation of genetic pool of the Ukrainian people

The State implements a set of measures aimed at elimination of factors that have a devastating impact on the human genetic system, as well as establishes a system of State genetic monitoring, organizes medicogenetic aid for the public, assists in enrichment and dissemination of scientific information in the field of genetics and demography, in the interests of preserving the gene pool of the Ukrainian people, preventing a demographic crisis, assuring the health of future generations and prevention of hereditary diseases.

Medical interventions that could impair the human genetic system are prohibited.

Article 30. Prevention of dangerous infectious diseases

The State provides for regular, scientifically validated prevention, treatment, localization and eradication of mass scale infectiousdiseases.

Individuals who are carriers of pathogens of infectious diseases that are dangerous to the public are removed from work and other activities that could be instrumental in the spread of infectious diseases, and they are subject to medical supervision and treatment at the State's expense, with payment, if necessary, of social insurance benefits. Mandatory physical examinations, preventive inoculations, therapeutic and quarantine measures may be carried out, following procedure established by Ukrainian laws, for some particularly dangerous infectious diseases.

In case of danger of onset or spread of epidemic diseases, the president of the Ukraine, in accordance with Ukrainian laws and recommendations of health care agencies, can call for special working, educational, traffic and transportation conditions and schedules over the entire Ukrainian territory or individual localities, which are aimed at averting the spread of such diseases and eradicating them.

Local State administrative, regional and local self-government agencies must actively cooperate in implementation of epidemic-control measures.

The list of particularly dangerous and dangerous infectious diseases, and conditions for declaring that someone has an infectious disease or is a carrier of the pathogen of an infectious disease are determined by the Ukrainian Ministry of Health and published in official sources.

Article 31. Mandatory physical examinations

Preventive physical examinations are organized, for the purpose of safeguarding public health, for minors, pregnant women, employees of enterprises, institions and organizations that have deleterious and hazardous working conditions, military personnel and individuals whose professional or other activities are related to services for the public or increased danger to others.

Proprietors and administrators of enterprises, institutions and organizations are held responsible for timely mandatory physical examination of their employees and consequences that are deleterious to health of the public, which have been caused by permitting individuals to work without undergoing a mandatory physical examination.

The list of population categories subject to mandatory physical examinations, their frequency, sources of funding and procedure of such examinations are determined by the Ukrainian Cabinet of Ministers.

Article 32. Furthering a healthy lifestyle

The State assists in the public in developing a healthy lifestyle by means of dissemination of scientific information on health care matters, organization of medical, ecological and physical education, implementation of measures aimed at improving hygienic education of the public, provision of necessary conditions, including medical supervision, for physical culture, sports and tourism, development of a network of preventoriums, recreational bases and other health-improving institutions, at control of habits that are deleterious to human health, establishment of a system of socioeconomic incentives for individuals who have a healthy lifestyle.

Holding healing sessions and carrying out other analogous measures involving use of hypnosis and other mental or bioenergetic methods aimed at a mass audience are prohibited without special permission of the Ukrainian Ministry of Health, in order to prevent harm to health of the public.

Section V. Treatment and Preventive Care

Article 33. Providing treatment and preventive care

Treatment and preventive care are provided to Ukrainian citizens by polyclinics, hospitals, dispensaries, clinics of research institutes and other accredited health care institutions, emergency medical care service, as well as individual medical workers with the appropriate permit (license).

Special medical-preventive institutions are established to give therapeutic and preventive care to Ukrainian citizens who enjoy appropriate benefits as established by legislation.

Article 34. Attending physician

The attending physician can be chosen directly by a patient or assigned by the administrator of a health care institution or its subordinate department. The duties of the attending physician are prompt and qualified examination and treatment of the patient. The patient has the right to ask for another physician.

The physician has the right to refuse further management of a patient if the latter does not carry out medical instructions or intramural rules of the health care institution, provided that this would not endanger the life of the patient and health of the public.

The physician is not liable for the health of a patient if the latter refuses to carry out medical instructions or does not adhere to the regimen established for him.

Article 35. Types of treatment and preventive care

The State guarantees accessible, socially acceptable primary treatment and preventive care as the chief component of medicosanitary aid which implies consultation of a physician, simple diagnostic procedures and treatment of the main and most widespread diseases, trauma and poisoning, preventive measures, referral of patient for specialized and highly specialized care. Primary treatment and preventive care are rendered mainly on a territorial basis by family physicians or other general practitioners.

Specialized (secondary) medical-preventive care is rendered by physicians who have the appropriate specialization and can provide more qualified consultation, diagnosis, prevention and treatment than general practitioners.

Highly specialized (tertiary) medical-preventive care is rendered by physicians or a team of physicians who have appropriate training in the field of diseases that are difficult to diagnose and treat, in the case of treatment of diseases requiring special diagnostic and therapeutic methods, as well as for the purpose of diagnosing and treating rare diseases.

Article 36. Patient referral abroad

Ukrainian citizens may be referred abroad for treatment in case of need for a type of medical care that cannot be rendered in Ukrainian health care institutions.

State agencies are obliged to assist Ukrainian citizens in travel and stays abroad.

Procedure for referring Ukrainian citizens abroad for treatment is established by the Ukrainian Cabinet of Ministers.

Article 37. Urgent and emergency medical care

Medical workers must render first emergency care in cases of accidents and acute diseases. Medical care is provided by the medical first aid service or closest medical-preventive institution, regardless of departmental subordination and forms of ownership with subsequent reimbursement of expenses.

In urgent cases, when it is impossible to administer on-site care due to absence of medical personnel, enterprises, institutions, organizations and citizens must provide transportation to move the victim to a medical-preventive institution. In such cases, first aid should also be given by militia, fire department, accident service personnel, vehicle operators and representatives of other occupations upon whom this duty is placed by legislation and official instructions.

If there is a threat to a patient's life, medical personnel and other citizens have the right to use any available vehicle to get to the patient's location in order to administer urgent care or transport him to the nearest medical-preventive institution.

Administration of free medical care to citizens in emergency situations (natural calamity, accident, disaster, mass poisoning, epidemic, epizootic, radiation, bacteriological and chemical contamination, etc.) is the duty, first of all, of specialized brigades of the urgent medical care service, with reimbursement in full of necessary expenses of local health care institutions at the expense of centralized funds.

Citizens who were involved in rescuing people and helped render medical care in an urgent or emergency situation are guaranteed free treatment and financial compensation for harm to their health and property, if necessary, following procedure established by legislation.

Government agencies and special institutions that service medical institutions are held liable for delayed and poor quality of medical care.

Article 38. Choice of physician and medical institution

Each patient has the right to free choice of physician, if the latter is available.

Every patient has the right, if warranted by his condition, to be accepted in any State medical-preventive institution of his choice, if this institution is able to provide the needed treatment.

Article 39. Obligation to provide medical information

The physician must explain to the patient, in understandable terms, the condition of his health, purpose of suggested tests and therapeutic measures, prognosis of possible development of disease, including presence of risk to life and health.

The patient has the right to see his case history and other documentation that could be useful in subsequent treatment.

In special cases, when complete information could harm the patient's health, the physician can limit it. In this case, he informs family members or the patient's legal representative, with consideration of the patient's personal interests. The physician takes the same action if the patient is unconscious.

Article 40. Physician's confidentiality

Medical workers and others who learned about a citizen's illness, physical examination, and results, his intimate and family life in the course of carrying out their professional or business duties, do not have the right to divulge such information, with the exception of instances stipulated in legislative acts.

When privileged medical information is used in the educational process or research, including instances where it is published in the special literature, the patient must remain anonymous.

Article 41. Sick leave

Citizens are granted leave from their work for the duration of their illness involving temporary disability, with payment of social insurance benefits following procedure established by Ukrainian legislation.

Article 42. General conditions of medical intervention

Medical intervention (use of diagnostic, preventive or treatment methods affecting the human body) is permitted only if it cannot cause harm to the patient's health.

Medical intervention that entails a risk to the patient's health is permitted as an exception, when there is an acute need, if the potential harm of the diagnostic, preventive or having therapeutic method is less than the harm expected if intervention is denied, and it is impossible to eliminate the danger to the patient's health by other methods.

Risky diagnostic, preventive or treatment methods are deemed permissible if they meet current scientifically validated requirements, are aimed at preventing a real threat to life and health of the patient, used with the consent of the patient after he is informed about the possible harmful consequences, and the physician takes

all measures appropriate to such cases to prevent detriment to the patient's health and life.

Article 43. Consent to medical intervention

The consent of an objectively informed competent patient is required for use of diagnostic, preventive and therapeutic methods. If the patient has not reached the age of 15 years, or is declared legally incompetent, or cannot express his wishes due to his physical condition, medical intervention can be performed with the consent of parents or other legal representatives of the patient. Such intervention can be performed on individuals 15 to 18 years old or with legally diminished capacity with their consent and consent of their parents or other legal representatives.

In emergency cases when there is a real threat to the patient's life, the consent of the patient or his legal representatives to medical intervention is not required.

If absence of consent could lead to serious consequences for the patient, the physician must explain this to him. If even after this the patient refuses treatment, the physician has the right to get a written confirmation from him and, if this is unfeasible, to certify the refusal in the appropriate form in the presence of witnesses.

If the refusal is made by the patient's legal representative and it could have serious consequences for the patient, the physician must report this to legal guardianship and trusteeship agencies.

Article 44. Use of preventive, diagnostic, therapeutic methods and drugs

In their practice, physicians must use the preventive, diagnostic and therapeutic methods, and drugs permitted by the Ukrainian Ministry of Health.

In the interests of curing a patient and with his consent and, with respect to minors and those declared legally incompetent, the consent of their parents, guardians or trustees, the physician can use new, scientifically validated diagnostic, preventive, therapeutic methods and drugs, which have not yet been allowed for general use. With respect to individuals 15 to 18 years old or declared to have limited legal competence, use of such methods and drugs can be made with their consent and the consent of their parents or other legal representatives.

The procedure for using the above-mentioned diagnostic, preventive, therapeutic methods and drugs is established by the Ukrainian Ministry of Health.

Article 45. Biomedical experiments on humans

Biomedical experimentation on humans is permitted for a socially useful purpose, provided: they are scientifically validated, the possibility of success outweighs the risk of serious consequences to health or life, there is announcement of use of the experiment, the subject is fully informed about what the experiment entails and has given his consent, and doctor-patient confidentiality is observed when necessary. It is prohibited to carry out research experiments on patients who are incarcerated or prisoners of war, as well as to carry out therapeutic experiments on people whose illness has no direct bearing on the purpose of the study.

The procedure for carrying out biomedical experiments is regulated by legislative acts of the Ukraine.

Article 46. Donation of blood and its components

Blood for therapeutic use is donated voluntarily by citizens. It is prohibited to take blood by force, or from individuals whose diseases could be transmitted to a recipient or harm his health. Health care agencies and institutions, with the cooperation of administrators of enterprises, institutions and organizations, must develop donorship in every way.

Donors enjoy benefits as stipulated by Ukrainian legislation.

Article 47. Transplantation of organs and other anatomical material

The method of donor to recipient transplantation of organs and other anatomical material is used according to specific legislative procedure, with their consent or with the consent of their legal representatives, provided that use of other means and methods of supporting life, restoration or improvement of health does not yield the desired results, and the harm sustained by the donor is outweighed by the harm that the recipient is facing.

Article 48. Artificial insemination and embryo implantation

Artificial insemination and embryo implantation are performed according to conditions and procedure established by the Ukrainian Ministry of Health, at the request of a competent woman on whom such procedures are performed, provided there is written consent of her husband, donor anonymity and observation of medical confidentiality.

Disclosure of a donor's name could occur following procedure stipulated in legislation.

Article 49. Use of sterilization methods

Sterilization methods can be used at the discretion or with the voluntary consent of the patient in accredited health care institutions when medically indicated, as stipulated by the Ukrainian Ministry of Health.

Article 50. Voluntary interruption of pregnancy

Artificial interruption of a pregnancy (abortion) can be carried out in accredited health care institutions within 12 weeks of conception at a woman's discretion.

Abortions can be performed between the 12th to 28th weeks of the gestation period with social and medical indications in individual cases and following procedure established by the Ukrainian Cabinet of Ministers.

Article 51. Sex change procedures

At the request of the patient and in accordance with biomedical and sociopsychological indications established by the Ukrainian Ministry of Health, medical intervention can be carried out at accredited health care institutions for the purpose of sex change (correction).

A medical certificate is issued to the individual who has undergone a sex change, on the basis of which the question of appropriate changes in his legal status is subsequently settled.

Article 52. Medical care of patients in critical condition

Medical workers must render a full volume of medical care to a critical patient. Such care can also be administered in specially created health care institutions that enjoy benefits from the State.

Active life-support measures are stopped if irreversible death has been determined. Procedure for discontinuing such measures, concept and criteria of death are defined by the Ukrainian Ministry of Health, in accordance with modern international requirements.

It is prohibited for medical workers to practice euthanasia—the deliberate acceleration of death or killing of an incurable person in order to stop his suffering.

Article 53. Special preventive and therapeutic methods for socially dangerous diseases

Health care agencies and institutions must carry out special preventive and therapeutic measures for socially dangerous diseases (tuberculosis, mental illness, sexually-transmitted diseases, AIDS, leprosy, chronic alcoholism, drug addiction), as well as quarantinable diseases, in order to safeguard the health of the public.

The procedure for hospitalization and treatment of such patients, including forced steps, is established by legislative acts of the Ukraine.

Article VI. Supplying Drugs and Prostheses

Article 54. Procedure for supplying drugs and immunological agents

Citizens are supplied with drugs and immunobiological agents through pharmacy and medical-preventive institutions.

The procedure for supplying drugs and immunobiological preparations to the public free or on preferential terms is defined by Ukrainian legislation.

Pharmacy and medical-preventive institutions may dispense only the drugs and immunobiological agents, use of which is permitted by the Ukrainian Ministry of Health, and they are responsible for maintaining appropriate conditions for their storage and sale, as well as having the mandatory assortment of drugs and immunobiological agents, including the necessary reserve in case of epidemic diseases, natural calamities and disasters.

The Ukrainian Ministry of Health regularly informs health care workers and the public about drugs and immunobiological agents, the use of which is permitted.

Article 55. Manufacture of drugs and immunobiological agents

Manufacture of new drugs and immunobiological agents for medical purposes is allowed with permission of the Ukrainian Ministry of Health, after determination of their therapeutic or prophylactic efficacy.

The quality of drugs and immunobiological agents must conform to requirements in the Ukrainian State Pharmacopoeia and specifications approved following established procedure.

The Ukrainian Ministry of Health monitors the quality of drugs and immunobiological preparations manufactured by enterprises of the Ukraine.

Article 56. Supplying prosthesis

When necessary, prosthesis, orthopedic and corrective items, eyeglasses, hearing aids, equipment for therapeutic physical culture and special means of transportation are provided to citizens.

The categories of individuals eligible for free or preferential terms for the above items and supplies, as well as conditions and procedure for furnishing them, are established by Ukrainian legislation.

Section VII. Mother and Child Care

Article 57. Incentives for mothers. Guaranteed health care for mothers and children

The State protects and offers incentives for mothers.

Mother and child health care is provided by: organizing a broad network of gynecological, medicogenetic and other offices, maternity homes, sanatoriums and rest homes for pregnant women and mothers with children, creches, kindergartens and other children's institutions; granting maternity leave with payment of social insurance benefits and allowing work breaks to nurse the infant; paying, according to established procedure, benefits related to the birth of a child and benefits for staying at home to care for a sick child; prohibition of employment of women in heavy and unhealthy industries, transfer of pregnant women to light work with retention of average earnings; improvement and sanitization of living and working conditions; elimination of negative ecological factors; State and social assistance to families, and other measures following procedure established by Ukrainian legislation.

For purposes of safeguarding the health of a woman, she has the right to make the decision to have children.

Article 58. Medical care for pregnant women and neonates

Health care institutions provide qualified medical supervision in the gestation period, in-hospital medical care at the time of delivery, treatment and preventive care of the mother and newborn infant.

Article 59. Concern for strengthening and protecting the health of children and adolescents

Parents must be concerned about the health of their children, their physical and spiritual development, and having them lead a health lifestyle. If this duty is not performed, and this causes substantial harm to a child's health, the guilty parties can be deprived of parental rights in accordance with established procedure.

In order to rear a healthy young generation with harmonious development of physical and spiritual strength, the State provides for development of a broad network of nursery schools, boarding schools, health centers, vacation camps and other children's institutions.

Children who are reared in children's institutions and attending school are provided with the necessary conditions to safeguard and strengthen health, and hygienic education. Conditions for study and work load, as well as requirements as to class schedules, are defined in coordination with the Ukrainian Ministry of Health.

Article 60. Medical care of children and adolescents

Medical care is provided to children and adolescents at medical-preventive and health institutions, pediatric polyclinics, departments, dispensaries, hospitals, sanatoriums and other health institutions. Children are given free travel passes to State pediatric sanatoriums.

Children and adolescents are under clinical supervision.

Article 61. Child nutrition

For children up to 3 years old, the State provides for high-quality formulas and other baby food produced commercially from ecologically pure raw materials.

State sanitary oversight agencies are charged with monitoring sanitary-hygienic and other standards for baby foods.

Article 62. Monitoring child health protection in child-rearing and educational institutions

Health care agencies and institutions, along with public education agencies and institutions, with the participation of public organizations, monitor health protection of children and implementation of health-improving measures.

Article 63. State aid to citizens in caring for children with physical or mental developmental defects

Children with developmental physical or mental defects requiring sociomedical aid and special care may, at the discretion of their parents or individuals who replace them, be placed in child centers, children's homes and other children's institutions at the State's expense.

Sociomedical aid is provided for families or other individuals and institutions with such dependent children following procedure established by the Ukrainian Cabinet of Ministers.

Article 64. Benefits for mothers with a sick child

When it is impossible to hospitalize a sick child or there are no indications for hospital care, the mother or other family member caring for the child can be given leave from work, with payment of benefits from the social insurance fund in accordance with established procedure. In the case of hospital treatment of children up to 6 years old, as well as severely ill older children, requiring maternal care in the opinion of physicians, mothers or other family members are given the opportunity to remain with the child in the medical institution, with provision of free food and living conditions, and payment of social insurance benefits in accordance with established procedure.

Article 65. Monitoring vocational training, apprenticeship, and working conditions of adolescents

On-the-job training of adolescents is permitted in accordance with legislation in occupations that are consistent with their age, physical and mental development, and health status. Vocational and on-the-job training are carried out under regular medical supervision.

Health care agencies and institutions, together with proprietors of enterprises, institutions, organizations, as well as vocational-technical education agencies, public education agencies and public organizations monitor adolescent working conditions, as well as implementation of special measures aimed at disease prevention.

Article 66. Mandatory medical certification of working adolescents

Medical certification of adolescents is mandatory for their employment. Medical certification of employed adolescents must be carried out regularly, at least once a year.

Section VIII. Medicosanitary Support of Sanatorium-Resort Care and Vacations

Article 67. Medicosanitary support of sanatorium and resort care

Sanatorium and resort institutions carry out their work following procedure stipulated in resort legislation. In order to provide for appropriate treatment and preventive care, the opening of a sanatorium-resort institution, establishment of its specialization (medical field), medical indications and contraindications for sanatorium and resort therapy are coordinated with the Ukrainian Ministry of Health or its authorized agency.

The need for sanatorium-resort treatment is determined by a physician on the basis of the patient's condition and backed up by medical documentation in accordance with the form established by the Ukrainian Ministry of Health.

Health care agencies must give scientific-methodological and consultant aid to sanatorium and resort institutions.

State monitoring of treatment and preventive care in sanatorium-resort institutions is implemented by the Ukrainian Ministry of Health and its authorized agencies, which have the right to suspend the activities of such institutions due to violation of legislation on health care or legal rights and interests of children, in accordance with procedure established in legislative acts.

Article 68. Medicosanitary support of vacations

Proprietors and administrators of rest homes, boarding houses, tourist centers, other enterprises, institutions and organizations involved in organizing vacations for the public must provide healthy and safe conditions, adhere to health care legislation and sanitary-hygienic standards, and offer the opportunity for rendering necessary treatment and preventive care to vacationers.

Health care agencies implement State control of medicosanitary support of the vacationing public.

Section IX. Expert Medical Opinions

Article 69. Sociomedical expertise on incapacity for work

An expert opinion on temporary disability of citizens is provided at health institutions by a physician or commission of physicians, whodetermine the necessity for work leave because of illness, injury, pregnancy and childbirth, to care for a sick family member, during quarantines, for prosthetic services, sanatorium-resort treatment; they determine the necessity and duration of temporary transfer of an employee to a different job because of illness following established procedure, and they also make decisions on referral to a sociomedical expert commission for determination of existence and severity of prolonged or permanent disability.

Expert evaluation of long-term or permanent disability is made by sociomedical expert commissions, which determine the severity and cause of disability, indicate jobs and occupations that invalids can handle, check propriety of using the labor of invalids according to the conclusion of the expert commission, and assist in restoring their fitness for work.

The conclusions of sociomedical expert agencies as to conditions and nature of employment of invalids are binding on proprietors and management of enterprises, institutions and organizations.

Procedure for organization and implementation of sociomedical expertise is established by the Ukrainian Cabinet of Ministers.

Article 70. Military medical expertise

Military medical expertise determines fitness for military service of draftees, military personnel and reservists, it determines the causative relationship of diseases, wounds and trauma to military service, and the necessity and conditions for use of sociomedical rehabilitation and aid for military personnel.

Expert military medical opinions are provided by military medical commissions formed under military commissariats and health care institutions under the Ukrainian Ministry of Defense, Ukrainian Security Service and other military formations.

Procedure for organization and providing a military medical expert opinion is established by the Ukrainian Cabinet of Ministers.

Article 71. Forensic medical and forensic psychiatric expertise

Expert forensic medical and forensic psychiatric opinions are ordered by an individual conducting an inquest, investigator, prosecutor or court according to procedure established by legislation, in order to answer questions requiring special knowledge in the field of forensic medicine or forensic psychiatry.

The Ukrainian Ministry of Health implements organizational supervision of the forensic medical and forensic psychiatric services.

Article 72. Autopsies

Autopsies are performed in order to determine causes and mechanisms of patient death.

Autopsies are mandatory if there is suspicion of murder, as well as when death of a patient occurred in health care institutions, with the exception of cases stipulated in the third part of this article.

An autopsy may not be performed if there is written objection by close relatives or documented expression of the decedent's wishes, in the absence of suspicion of a violent death, or on the basis of religious and other valid reasons.

Procedure for performing autopsies is determined by the Ukrainian Ministry of Health.

Article 73. Alternative medical expert opinion

If a citizen disagrees with the State medical expert opinion and in other instances stipulated by legislation, an alternative medical (medicosocial, military medical, forensic medical, forensic psychiatric and others) opinion or autopsy may be carried out at the request of the citizen.

Alternative expert medical opinions are provided by specialists in the pertinent field and with the appropriate qualifications. Citizens make an independent choice of expert institution and experts.

Procedure and conditions for obtaining an alternative expert medical opinion are determined by the Ukrainian Cabinet of Ministers.

Section X. Medical and Pharmaceutical Activities

Article 74. Engaged in medical and pharmaceutical work

Individuals with appropriate specialized education who meet unified qualification requirements may engage in medical and pharmaceutical work.

As an exception, by special permission of the Ukrainian Ministry of Health or authorized health care agency, individuals without specialized education are allowed to work in the field of folk and nontraditional medicine.

Unified qualification requirements for individuals engaged in specific types of medical and pharmaceutical work, including the field of folk and nontraditional medicine, are established by the Ukrainian Ministry of Health. Administrators of health care institutions and agencies which have the right to issue permits (licenses) for individual entrepreneurial activities in the field of health care are responsible for adherence to the said qualification requirements.

Individuals who have undergone medical or pharmaceutical training in educational institutions of foreign countries are permitted to engage in professional activities after their qualifications are checked in accordance with procedure established by the Ukrainian Ministry of Health, unless otherwise stipulated in legislation or international agreements, in which the Ukraine participates.

Article 75. Training, retraining and advanced training of medical and pharmaceutical workers

Training, retraining and advanced training of medical and pharmaceutical workers are provided by pertinent secondary specialized and higher educational and research institutions, institutions for advanced training and retraining of personnel, as well as internship, clinical residency, postgraduate and doctoral programs, in accordance with educational legislation.

Syllabuses and curriculums for training, retraining and advanced training of medical and pharmaceutical workers are coordinated with the Ukrainian Ministry of Health in accordance with established procedure.

Article 76. The Ukrainian physician's Oath

Graduates in medical specialties of higher medical educational institutions take the Ukrainian physician's Oath.

The text of the Ukrainian physician's Oath is approved by the Ukrainian Cabinet of Ministers.

Article 77. Professional rights and benefits of medical and pharmaceutical workers

Medical and pharmaceutical workers have the right to: a) engage in medical and pharmaceutical activities in accordance with their specialty and qualifications; b) appropriate working conditions; c) advanced training and retraining at least once every 5 years in pertinent establishments and institutions; d) free choice of tested forms, methods and means of work, adoption of modern advances in medical and pharmaceutical science and practice in accordance with established procedure; e) free use of social, ecological and special medical information essential to performance of professional duties; f) mandatory insurance at the expense of the proprietor of the health care institution in case of harm to their life and health related to performance of professional duties, in the instances stipulated by legislation; g) social aid on the part of the State in case of illness, mutilation or other cases of disability occurring in connection with performance of professional duties; h) establishment in State health care institutions of average rates and salaries on a level no lower than the average wages of industrial workers; i) shortened work day and additional paid leave in the cases established by legislation; j) preferential pensions; k) free use of apartment with heat and electricity for those living in rural areas, preferential terms for land taxes, credit, acquisition of a farm and construction of their own housing, acquisition of motor vehicles; l) priority in receiving medical-preventive care, drugs and prostheses; m) form scientific medical societies, professional unions and other social organizations; n) legal protection of professional honor and dignity.

Legislation may provide for other rights and benefits for medical and pharmaceutical workers. Employee benefits established by enterprises, institutions and organizations to which said workers render medicosanitary aid may also extend to them.

Article 78. Professional duties of medical and pharmaceutical workers

Medical and pharmaceutical workers have the duty to: a) cooperate in safeguarding and strengthening the health of the public, prevention and treatment of diseases, provide prompt and qualified health and medical care.b) administer free urgent medical care to the public in case of accident or other emergency situations; c) disseminate scientific and medical information among the public, campaign for a healthy lifestyle, including presentation of said workers as models; d) adhere to requirements of professional ethics and deontology, and maintain medical confidentiality; e) constantly advance professional knowledge and skill; f) render consultant aid to their coworkers and other health care workers.

Medical and pharmaceutical workers also have other duties as provided in legislation.

Section XI. International Collaboration

Article 79. International collaboration in the field of health care

The Ukraine is a participant in international collaboration in the field of health care, member of the World Health Organization (WHO) and other international organizations. The State guarantees to said organizations appropriate conditions on the territory of the Ukraine, cooperates in expansion an deepening of the Ukraine's participation in measures that they carry out.

In accordance with its international legal obligations, the State participates in implementation of international health care programs; it exchanges ecological and medical information; it assists in professional and scientific contacts between health care workers, exchange of progressive methods and technology, export and import of medical equipment, drugs and other merchandise essential to health, activities of joint enterprises in the field of health care; it organizes joint training of specialists, develops and supports all other forms of international cooperation that are not in contradiction to international law and national legislation.

Health care institutions, citizens and associations thereof have the right to conclude, in accordance with existing legislation, agreements (contracts) with foreign juridical and physical entities concerning any form of collaboration, to participate in the activities of pertinent international organizations, and to engage in foreign economic activities.

Illegal restriction of international collaboration on the part of State agencies and officials may be appealed following established procedure, including court action.

Section XII. Liability for Violation of Health Care Legislation

Article 80. Liability for violation of health care legislation

Individuals guilty of violating public health care legislation bear civil, administrative or criminal liability in accordance with legislation.

Decree on Putting Into Effect the "Fundamentals of Health Care Legislation of the Ukraine"

937C0407C Kiev GOLOS UKRAINY in Russian 15 Dec 92 pp 9-13

[Decree of the Supreme Soviet of the Ukraine On Putting Into Effect the "Fundamentals of Health Care Legislation of the Ukraine," signed by I. Plyushch, chairman of the Ukrainian Supreme Soviet, on 19 Nov 92]

[Text]The Supreme Soviet of the Ukraine hereby decrees:

1. To put into effect the Fundamentals of Health Care Legislation of the Ukraine as of the day of their publication.

2. To establish that existing legislative acts of the Ukraine apply insofar as they are not in contradiction to these Fundamentals until Ukrainian legislation is brought into line with the Fundamentals of health care legislation of the Ukraine.

3. The Ukrainian Cabinet of Ministers is to: submit to the Supreme Soviet of the Ukraine suggestions on putting Ukrainian legislative acts into line with the Fundamentals of Health care legislation of the Ukraine before 1 February 1993; adopt enforceable enactments on application of the Fundamentals of health care legislation of the Ukraine, referred by said Fundamentals to the purview of the Ukrainian Cabinet of Ministers, before 1 November 1993.bring other decisions of the Ukrainian Government into line with the Fundamentals of Health Care Legislation of the Ukraine and implement addition of appropriate amendments to enforceable enactments of ministries, departments and other State administrative central agencies of the Ukraine before 1 November 1994;elaborate and adopt scientifically validated norms for funding health care.

4. The Commission for Public Health Affairs of the Ukrainian Supreme Soviet is to implement monitoring of execution of this Decree.

RF National Fund for Invalids

937C0407D Moscow FEDERATSIYA in Russian No 41, 13 Apr 93 p 61

[Regulation No 202-rp of the RF president On Establishment of National Assistance Fund for Russian Federation Invalids, signed by B. Yeltsin, president of the Russian Federation, on 27 Mar 93]

[Text]for the purpose of assisting in implementation of the initiative of enterprises, institutions, organizations, ad hoc creative groups and individual citizens aimed at achieving in the Russian Federation the goals of the World Program of Action Concerning Invalids:

1. It is deemed purposeful to establish the National Assistance Fund for Russian Federation Invalids (hereafter referred to as the National Fund) as a State enterprise.

2. It is established that the main purpose of the National Fund is to offer expertise, competitive selection and participation in funding innovative programs, plans and measures aimed at solving problems of disability and invalids at its own expense and using other procured resources, including those obtained from the financial and business activities of the National Fund.

3. The composition of the organizing committee to establish the National Fund is to be approved in accordance with the Appendix.

4. The organizing committee for establishment of the National Fund must prepare within two months and submit for approval to the the Council of Ministers

Russian Federation Government drafts of founding documentation for the National Fund, proposals pertaining to personnel administrative agencies, allocation to the National Fund from the Russian Federation State reserves of physical assets of said agencies for export in accordance with the products list and in quantities providing for recovery of hard currency totaling at least one million U.S. dollars, issuing licenses necessary for activities and providing building space for the National Fund.

5. Following established procedure, the Council of Ministers—Russian Federation Government is to allocate the sum of 100 million rubles as the State's contribution to the charter fund of the National Fund.

Measures for Implementation of Russian Federation Law on Health Insurance Citizens in the RF

937C0411B Moscow VRACH in Russian No 2, Feb 93 pp 5-7

[Order No 93 of the RF Ministry of Health: On Measures for Implementation of the Russian Federation Law "On Health Insurance of Citizens in the RF," dated 20 March 1992]

[Text]Appendix 3

Standard Contract

for providing medical and preventive care (medical services) through mandatory (voluntary) health insurance city: 50 19 3 Health insurance organization 40 50 (name) hereafter referred to as "Insurer" which has license No 20 dated 20 19 3 issued to 40 30 (name of agency) in the person of 40 20 (position, surname, name, patronymic) acting on the basis of the Charter, on the one hand, and medical institution 20 40 (name) hereafter referred to as "Institution," which has license No 20 dated 20 19 3 issued by 60 25 (name of commission that issued license) 60 and certificate No 20 dated 20 19 3 issued by 60 25(name of agency that issued certificate) in the person of 40 20 (position, surname, name, patronymic) acting on the basis of 45 on the other hand, have concluded the present contract concerning the following:

1. Subject of Contract

1.1. The insurer assigns and the Institute assumes the obligation to render medical and preventive care to citizens to whom the Insurer has issued an insurance policy with assignment to an Institution. Said citizens are hereafter referred to as "insured group." The Institution renders medical-preventive care to other citizens as well, upon referral by the Insurer. Such citizens enjoy the rights of the insured group to the extent indicated in the referral.

2. Scope and Quality of Medical and Preventive Care

2.1. The Institution must provide consistency of medical-preventive care to established professional standards.

2.2. The Institution renders medical-preventive care to the insured group, the types, scope and time of which are established by a list agreed upon by the parties, which is an inseparable part of this contract (with mandatory health insurance, this list must conform to the territorial program of mandatory health insurance).

2.3. If it is impossible for an Institution to render medical-preventive care of an established type, scope, time and/or standard, it must, at its own expense, provide such care for the insured group in another medical institution or by calling in an appropriate specialist.

The Institution must immediately inform the Insurer when it is impossible for it to render medical-preventive care of an established type, scope and/or standard.

Consent of the insured citizen and Insurer (with the exception of urgent medical care) must be obtained for medical-preventive care in another medical-preventive care institution chosen by the Institution.

2.4. The Institution must inform the Insurer about arising circumstances that could lead, within the immediate future, to violation of requirements of professional standards, reduction in type, scope and change in time of rendering medical-preventive care.

2.5. If it is impossible for the Institution to meet requirements in items 2.1 and 2.2. of this contract, the Insurer has the right, at its discretion, to transfer insured citizens to another medical institution for medical-preventive care, or to call in an appropriate specialist to administer medical-preventive care to the insured group at the Institution.

3. Number of Insured People

3.1. The insured group consists of 10 people. The Insurer has the right to alter this number by no more than 10 percent without the consent of the Institution.

3.2. The Insurer must submit to the Institution a list of the insured group with indication of data agreed upon by the parties within 10 days after this contract becomes effective.

3.3. The Insurer informs the Institution immediately about all changes in number [of people] in the insured group.

4. Cost of Services and Procedure for Settling Accounts

4.1. The Insurer pays for the medical-preventive care rendered by the Institution to the insured group at rates approved, following procedure established by the RSFSR Law "On Health Insurance of Citizens in the RSFSR."

4.2. Accounts are settled monthly by the Insurer by paying the Institution's claims within 5 days. When this term has elapsed, the funds are written off the account by the bank.

4.3. Accounts pertaining to payment of medical-preventive services rendered to the insured group are checked by the parties within the 5 th day of the month following the reporting quarter. A final check of the accounts is made no later than 5 January of the year following the reporting one.

The Institution submits to the Insurer all necessary accounting documentation.

4.4. The tentative amount covered by this contract is 20 rubles. This sum may change if there is a change in rates for medical services.

4.5. The Insurer transfers to the Institution an advance of 20 rubles within 5 days after this contract becomes effective.

5. Procedure for Rendering Medical-Preventive Care

5.1. The Institution renders medical-preventive care to the insured group in accordance with the work schedule coordinated with the Insurer.

6. Record-Keeping at Medical Institution

6.1. The Institution must keep records of: the insured group;type, volume and time of rendering medical-preventive care to the insured group;funds received from the Insurer.

Organization of accounting is coordinated with the Insurer.

7. Monitoring

7.1. The Insurer verifies consistency of medical-preventive care rendered with professional standards and this contract.

7.2. Monitoring is implemented by means of inspections carried out by a representative of the Insurer. Inspections are carried out as needed. The Insurer informs the Institution of the results of inspections.

7.3. If the Institution disagrees with the findings of the Insurer's representative, it has the right to turn to the territorial accreditation commission, within 5 days for settlement of the dispute. The commissions findings are mandatory for the parties.

7.4. The Institution must give free access to the Insurer's representative who is carrying out the inspection to activities of the Institution related to fulfillment of this contract.

8. Responsibility of the Parties

8.1. The Insurer remits a fine equaling 20 percent per day of the overdue amount in case of late payments stipulated in this contract. Payment of the fine does not exempt the Insurer from the basic payment. If the Insurer's payment is no more than 5 days overdue, the Institution must continue to render medical-preventive care to the insured group (applies to mandatory health insurance).

8.2. For failure to meet the due date indicated in Item 3.2 of this contract, the Insurer pays the Institution a forfeit in the sum of 10 .

8.3. For failure to meet the requirements in Item 7.4 of this contract, the Institution pays a penalty to the Insurer in the sum of 20.

8.4. For failure to meet the requirements in Item 6.1 of this contract, the Institution pays the Insurer a penalty in the sum of 20.

8.5. In addition to the sanctions indicated in items 8.3 and 8.4, if the Institution violates the conditions of this contract the Insurer has the right to withhold part or all of the reimbursement to the Institution for expenses in rendering medical-preventive care.

8.6. In the event one of the parties divulges information that is a trade secret of the second party, provided that such information was known to be such a secret, the guilty party must compensate the second party for loss sustained in this connection.

9. Responsibility-Releasing Circumstances

9.1. The parties are released from responsibility for partial or complete failure to perform their duties according to this contract, if such failure to perform was due to a force majeure (fire, flood, earthquake, other natural phenomena, as well as war, strikes and other circumstances at the discretion of the parties) arising after this contract was concluded.

9.2. If circumstances indicated in Item 9.1 occur, the party affected by such circumstances must immediately inform the second party.

Existence of a force majeure must be subsequently confirmed by 10 70 (name of agency or organization)

10. Notification and Reporting

10.1. All notifications and reports of the parties related to fulfillment of this contract must be made in writing.

10.2. The parties are obligated to inform one another immediately of any change in their addresses and description.

11. Amendment and Cancellation of Contract

11.1. This contract can be amended only with the written consent of the parties.

11.2. This contract may be canceled before it expires:—a) with the written consent of the parties;—b) at the

instigation of one party, provided the second party is notified in writing no later than 20 prior to expiration date of the contract.

12. Term of Contract

12.1. This contract becomes effective on the date it is signed by the parties and remains effective for 20.

13. Other Conditions 70 70 70

14. Parties are governed by Russian legislation on matters not covered in this contract.

15. Addresses and Description of Parties

15.1. Insurer 50

15.2. Institution 50

Signatures:

Appendix 5

Guaranteed List

of types of medical care (basic program) funded by budgets allocated for health care

1. Primary medical care, including:

1.1. Urgent medical care of the public in case of:—sudden illness and life-threatening states;—accidents, poisoning and trauma;—parturition;—severe and acute diseases.

1.2. Outpatient treatment, including care by other than physicians, of:—acute and exacerbated chronic diseases;—trauma and accidents.

1.3. Diagnosis and treatment at the home of patients who cannot visit a medical institution because of their condition and nature of illness.

1.4. Implementation of disease-prevention measures:organization and administration of preventive inoculations to children, adolescents and the adult unemployed population;clinical supervision, dynamic observation and implementation of scheduled medical sanitary and preventive measures for: 3 children 0 to 14 years old, including logoneurosis cases; 3 adolescents 15 to 18 years old, including logoneurosis cases; 3 pupils and students attending educational institutions; 3 the disabled, pensioners, veterans of the Great Patriotic War and individuals equated to them, participants of the war in Afghanistan;insertion of intrauterine devices and prescription of hormonal contraceptives; clinical supervision of patients with tuberculosis, endocrine and oncological diseases, those with history of myocardial infarction, acute cerebrocirculatory disorder, those with chronic renal insufficiency, mental and other diseases of danger to society.

1.5. Stomatological aid for: individuals up to 18 years, pupils and students attending an educational establishment, the disabled, pensioners, pregnant women, women with children up to 3 years (full scope);emergency stomatological care of patients; gingivitis, diseases of the oral mucosa; neoplasms of the maxillofacial region.

1.6. Drug supply in accordance with the list of diseases and states, in the presence of which there are preferential terms for drugs by decision of State administrative agencies.

2. Hospital Care for: patients with acute diseases and exacerbation of chronic ones, trauma, burns, poisoning, which present an immediate threat to the patient's life or others; infectious and oncological patients; obstetric patients; abortions on medical and social indications.

3. All types of first aid, as well as hospital care of patients with acute diseases and trauma are rendered to all individuals, regardless of place of residence and registration, are funded by the budget of territories where the above-listed types of aid are given.

Criteria and Priorities for Creating Psychophysiological Work Security System for Atomic and Thermal Energy Plant Operators

937C0354a Moscow ELEKTRICHESKIYE STANTSII in Russian No 7, Jul 93 (Signed to press 15 Jun 93) pp 19-25

[Article by A. V. Karpenko, doctor of medical science, Institute of Occupational Medicine, Ukraine Academy of Sciences]

[Abstract] The potential application of psychophysiological studies to the activities of power plant operators is discussed. Both training and monitoring should be involved. Operator selection should be based on medical, psychological, and psychophysiological factors and should be conducted at special training centers, not at power plants. About 50-70 of electric power plant accidents are due to personnel, of which 7result from lack of qualifications a d 25-30 from psychophysiological defects. Many accidents could be avoided if computerized daily psychophysiological monitoring systems were in place. The development of gradual occupational injuries might also be detected. The social and economic advantages of these proposals include obtaining more qualified applicants and operators, and less wasteful and costly training and operations. Daily monitoring would also permit efficient evaluation of ergonomic and other improvements which may be implemented. Operators would experience less stress, since their work capacity would be optimized. Work duration lifetime and safety would increase. Creation of monitoring systems should be the first priority; these systems could then be used as a basis for operator selection and training. Factual data about the psychophysiological requirements of the jobs must be obtained in order to realize the suggestions presented.

Ozone Holes: Forecasting in Human Photoecology. Protection and Sensitization

937C0333A Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 19 Feb 92), pp 591-597

[Article by I. I. Sapezhinskiy and Ye. L. Lozovskaya, Institute of Chemical Physics imeni N. N. Semenov, Russian Academy of Sciences, Moscow, under the rubric "Ultraviolet"; first paragraph is RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA introduction; UDC 539.1.04.577.346]

[Text]Photoecological consequences of formation of "ozone holes" are discussed. Estimates are made of increase in integral intensity of UV radiation and shift of the short-wave edge of atmosphere transmission as a function of ozone level. An evaluation is made of typical times of onset of photolesions to the skin and eyes with reduction in ozone level. There is discussion of the role of photosensitizers, including drugs, and onset of phototoxic effects. Possible mechanisms of photoprotection are examined.

Key words:*Ozone holes, photoecology, photosensitization, photoprotection*

The ozone layer is a natural light filter that protects all of the animate and inanimate world on the earth's surface against radiation at wavelengths of less than 300 nm. The first reports about "ozone holes" in the Antarctic appeared in the 1970s, although local changes in ozone concentration apparently also occurred earlier. The initial assumptions of the tremendous impact of launching spacecraft on formation of ozone holes were not confirmed. At present, it is assumed that local decrease in ozone content of the atmosphere is related primarily to photolysis of halogen-containing freons, as a result of which atoms of chlorine are formed and enter into chain reactions with ozone. In recent years, ozone holes appeared over Chili, Yakutiya, and central regions of Russia, and there is no warning system for them. Formation of ozone holes is a global problem for the entire planet, and for this reason extensive information about the possible consequences of this phenomenon is of unquestionable interest. In this survey, we shall examine the photoecological consequences to man of appearance of ozone holes, without discussing the effect of UV light on the flora and fauna, and various materials on formation of photochemical smog.

Physical Consequences of Formation of Ozone Holes

With Less than 300 nm Decrease in UV Radiation Ozone is unevenly distributed in the atmosphere, and its level (as compared to nitrogen, oxygen, and argon) is low. The thickness of the ozone layer scaled to atmospheric pressure is about 3 mm. A distinction is made between near-surface ozone, which is formed as a result of processes that take place at the earth's surface, and ozone that is formed under the effect of solar radiation in the upper layers of the atmosphere. As altitude increases, the ozone concentration first rises, then starts to drop; a maximum is reached at an altitude of 20-25 km. The ozone absorption spectrum is a wide band with a maximum at 255 nm, and absorption drops uniformly to 300-310 nm [1]. Optical density of a natural ozone layer at maximum absorption constitutes about 35, and at 300 nm it is 1.3. The spectrum of optical solar radiation beyond earth's atmosphere is a wide band, from vacuum UV to the near-IR region with a maximum at wavelengths of 400-500 nm. Figure 1 illustrates the spectrum of solar radiation in the 250-300 nm band [2]. We see that, in this band, radiation intensity is rather high. The integral flow of radiation in this band, not counting diffusion of UV rays in the atmosphere and absorption by dust particles, is 1.6 mW/cm^2, and with consideration of these phenomena it is 0.26 mW/cm^2 (the estimate of effect of diffusion and dust was made according to data in [3]). If there were no ozone light filter, permissible doses of UV radiation (3-5 mJ/cm^2 at 270 nm [4]) would build up in 10-15 s. Figure 2 illustrates data on the shift of the atmosphere transmission spectrum in the UV region with decrease in ozone concentration. With decrease in ozone level to one-third, radiation at wavelengths of 280-290 nm will reach the earth's surface, i.e., biologically the most effective. Figure 3 illustrates the results of estimates with consideration of photodiffusion of exposure doses of UV radiation at less than 300 nm with decrease in ozone concentration. We see that the radiation doses demonstrate nonlinear rise. With decrease in ozone concentration to 70 percent of the existing level, the radiation dose within the same time will undergo 5-fold increase, but if only 30 percent of the ozone remains, the dose will undergo 50-fold increase. Total disappearance of zone would lead to almost 500-fold increase in dose rate.

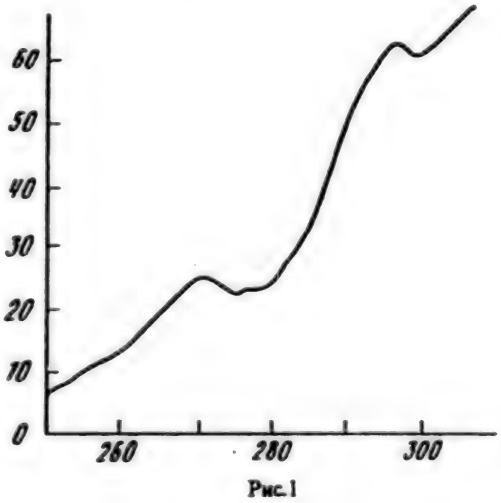

Рис.1

Figure 1. Intensity of solar radiation beyond the stratosphere, in the range of 250-300 nm

X-axis: solar radiation wavelength, nm; y-axis: intensity of radiation, mW/cm^2 x μm)

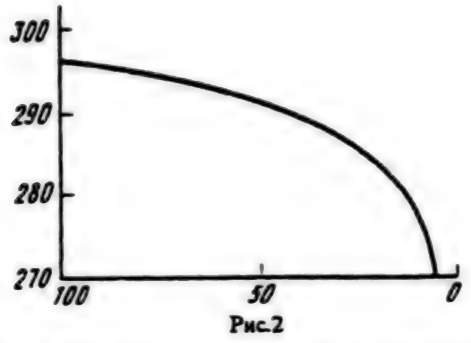

Рис.2

Figure 2. Change in short-wave edge of atmospheric transmission (wavelength at which optical density D = 2) with decrease in ozone

X-axis: ozone content, percent; y-axis: wavelength, nm

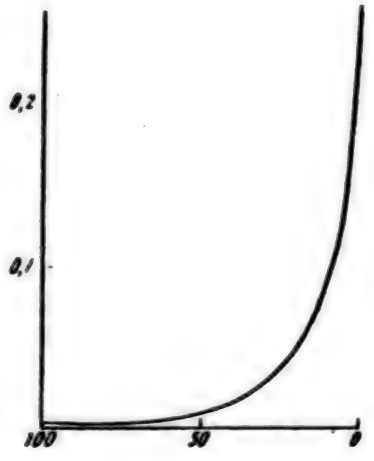

Figure 3. Increase in integral exposure dose of UV radiation in the range of 260-300 nm with decrease in ozone concentration

X-axis: ozone content, percent; y-axis: UV radiation exposure dose, mW/cm^2

Generally speaking, it is difficult to compare UV radiation exposure doses to doses of ionizing radiation, only estimates can be made [5]. If we consider the thickness of the cutaneous absorption layer to be 1 mm and quantum yield of photochemical conversions to be 0.1, the flux of UV energy in the absence of ozone would be 0.027 rad/s (about 1 Gy/h), which is a significant level that exceeds the dose rate in regions of strict monitoring of the Chernobyl Nuclear Power Plant.

Thus, a decrease in ozone concentration in the atmosphere would lead to dramatic rise in intensity of UV radiation at less than 300 nm and a shift of the short-wave edge of light transmission to the range of 280-290 nm.

Human Photoecology: Rise in Photopathology of the Skin and Eyes With Decrease in Ozone Concentration in the Atmosphere

A number of photobiological effects occur in the human skin under the effect of UV radiation [6]. The first is erythema, i.e., reddening of the skin due to dilatation of blood vessels. The spectrum of the erythemic effect is complex, and a distinction is made between UVA (320-400 nm), UVB (280-320 nm) and UVC (less than 280 nm) erythema. UVA erythema appears during exposure, elicits an inflammatory reaction in the corium, but not the epidermis, with doses of about 50 J/cm^2. UVB and UVC erythemas have an induction period of about 8-12 h, and occur with doses above 20-30 mJ/cm^2. The mechanism of onset of the different types of erythema is not clear. We do not know the light-absorbing chromophores, although for wavelengths below 290 nm the cutaneous proteins are the main chromophore. It is assumed [6] that, in the spectrum of action at 297 nm, the maximum refers to tocopherol, which has an absorption maximum at 292 nm. Breakdown of tocopherol under the effect of light probably initiates peroxidation of cutaneous lipids.

Tanning is a protective process of production of melanin, which screens the skin. The action spectrum of a tan is similar to the action spectrum of UVB erythema. A distinction is made between direct and indirect pigmentation. Direct pigmentation is related to photochemical oxidation (action spectrum from 300 to 700 nm) of melanin precursors to melanin and melanocytes. In the case of indirect pigmentation, tyrosinase is activated, which leads to a complicated chain of biochemical reactions in melanocytes: melanin biosynthesis is stimulated, melanocyte proliferation is activated, and there is increase in number and size of melanosomes.

Photoallergy is an increase in cutaneous sensitivity to light. It can arise with some disease and as a result of taking certain drugs (tetracycline, sulfanilamides). It has been shown that photoallergens are added to proteins, and this leads to formation of an immune response. New allergens react with macrophages and T lymphocytes. Even with mild, recurrent exposure to light, T lymphocytes recognize the allergen, and a cutaneous response occurs (erythema, edema, eczema), anaphylactic shock or asthma may develop.

Photocarcinogenesis refers to onset of carcinoma and sarcoma on the facial skin and external aspect of the arms induced by UV radiation. According to estimates, the action spectrum of photocarcinogenesiscoincides with the action spectrum of UVB and UVC erythema. As a rule, this is a cumulative process that arises with chronic irradiation in total exposure doses exceeding $5x10^3$ mJ/cm^2. The mechanism of UV carcinogenesis is not clear; most probably it affects cutaneous cell DNA. Photocarcinogenesis is enhanced in the presence of carcinogens, for example, 3,4-benzpyrene, which could be a photosensitizer.

Photolesions to the eyes, keratitis (inflammation of the cornea) and conjunctivitis (inflammation of the conjunctiva), occur as a result of the direct effect of UV light on the external parts of the eye. The doses at which such effects appear are comparable to the doses of the erythemic effect on the skin. Lesions to the lens occur with exposure doses that are 3-10 times higher, which could lead to cataracts in the case of chronic exposure. Table 1 summarizes the photobiological effects on man, action spectra, radiation doses and effective time of onset of effects in the absence of ozone in the atmosphere. The table shows that exposure for a few minutes is sufficient for onset of erythema, tanning, keratitis, and conjunctivitis. Chronic exposure for several hours is required for onset of sarcoma and carcinoma.

Table 1. Photobiological effects on man

Photobiological effect	Action spectrum	Exposure dose, mJ/cm^2	Time of appearance of effect in the absence of ozone
Permissible doses for those working with UV	260-290 nm	3-5	12-20 s
Erythema, burns, cutaneous edema, keratosis	<320 nm, maximum 297 nm	20-30	1-2 min
Tanning, skin pigmentation	<320 nm	20-30	1-2 min
Photoallergies (erythema, edema, eczema, anaphylactic shock, asthma)	Absorption spectrum of photoallergen	Chronic exposure	
Photocarcinogenesis	<320 nm	5000	5 h
Optic photolesions:			
—keratitis, conjunctivitis	<400 nm	20-30	1-2 min
—cataract	<400 nm	Chronic exposure	

Phototoxic Compounds: Potentially Hazardous Photosensitizers Among Metabolites, Drugs, Products of Plant Origin, Other Substances

Of course, UV radiation at $\lambda > 290$ nm is minimally absorbed by the main components of living cells, i.e., proteins, nucleic acids, and lipids, and therefore appearance of photobiological effects is related to photosensitization reactions, when active photolysis products are delivered to the system of substances that absorb light in this range. In real biological systems, this refers to coenzymes, vitamins, and others. Marked photosensitizing action was found (according to photochemiluminescence of glycyltryptophan solutions) in nicotinamide, flavine mononucleotide, riboflavin, pyridoxine, retinal, porphyrins, acetone and other ketones, NADH, and folic acid, with exposure to light at a wavelength of 313 nm (effectiveness drops in the listed order) [7]. With decrease in ozone concentration, there is dramatic rise in intensity of UV light in the range of 270-300 nm and, of course, we need to search and demonstrate substances with photosensitizing action in this range. Table 2 lists data on photosensitizing effects of a number of drugs on glycyltryptophan solutions with exposure to light at a wavelength of 313 nm and optic density of 0.1. The table shows that all of the listed substances have marked photosensitizing action. From the practical point of view, it would be desirable to have data on the function of such sensitizers in pharmacological concentrations. Porphyrins, tetracycline, phenothiazines, griseofulvin and furacillin are among the known photosensitizers. Plant extracts contain a large group of photosensitizers, and the best known is the naphthodianthrone dye, hypericin, which causes pruritis, edema and eczema in sheep, cows and horses that eat Hunter's wort [Hypericum]. Food dyes contained in various beverages and infusions, and in medicinal grasses may also emerge as photosensitizers. It should be noted, that there is only fragmentary information about potentially hazardous photosensitizers. Evidently, a special search must be made instituted in order to find them so as to avoid aggravating the effect of UV radiation penetrating through the ozone holes.

Table 2. Relative photosensitizing effectiveness of some drugs

Product	Relative yield of photosensitizatio	Product	Relative yield of photosensitization
Riboflavin	1.00	Levomycetin	0.04
Mydocalm	2.70	Furacillin	0.04
Psoralen	0.24	Sulfacyl	0.03
Pyridoxine	0.07	Aspirin	0.01

Photoprotection

The above data indicate that the intensity of UV radiation increases by many times with formation of ozone holes, and for this reason protective measures are needed to provide a "coefficient of solar protection" in UVB and UVC regions of the spectrum of 10-100, i.e., they would lower the severity of UV damage by 10^1-10^2. Outer clothing and eyeglasses are among the protective measures. Transmission of UV through loosely woven synthetic fabrics is often rather great and does not result in the required decrease in UV radiation doses. To date, the chief means of protecting exposed parts of the body from sunlight is to use shielding agents containing substances that absorb the UV component of sunlight. We are referring, first of all, to creams or ointments with a zinc oxide or titanium dioxide base, which are applied to limited parts of the skin. PABA (*p*-aminobenzoic acid), salicylates and PABA esters are also shielding agents.

The next step to minimize photolesions to the skin and eyes is chemical protection, interception of active photolytic products by various substances. It has now been learned that triplet excited states of photosensitizers, superoxide anion-radicals of $O_2^{-\bullet}$, singlet oxygen, free radicals and peroxide radicals of cell components, i.e., proteins, nucleic acids, lipids, various peroxides, are active products. For this reason, the next task is to find photoprotective agents among drugs and other substances. Table 3 lists data on efficacy of some agents that can interact with superoxide thus attenuating the severity of photolesions [8].

Table 3. Efficacy of some agents as $O_2^{-\bullet}$ acceptors

Substance	$c1/2$, M	Velocity constant, $M^{-1} \times s^{-1}$	Substance	$c1/2$, M	Velocity constant, $M^{-1} \times s^{-1}$
Superoxide dismutase	1.2×10^{-8}	2×10^{9}	*p*-Acetoaminophenol	1×10^{-6}	6.5×10^{7}
Etamsylate	8×10^{-8}	8×10^{8}	4-Hydroxy-5-methyl-hydrouracil	1.2×10^{-6}	5.4×10^{7}
Benzoquinone	1×10^{-7}	1×10^{9}	Serotonin	1.3×10^{-6}	5.3×10^{7}
Quercetin	1×10^{-7}	6.5×10^{8}	Cysteine	2×10^{-6}	2.7×10^{6}
Rutin	1.1×10^{-7}	6×10^{8}	Glutathione	4×10^{-6}	6.7×10^{5}
Ascorbic acid	9×10^{-7}	1×10^{8}	Butadion	5.10^{-6}	1.3×10^{7}
Analgin	1×10^{-6}	6.5×10^{7}			

Single oxygen interacts vigorously with tryptophanyl, histidine and sulfur-containing amino acid residues of proteins. Beta carotene is an effective quencher of singlet oxygen. Thus far, no systematic studies have been carried out of singlet oxygen quenching using known drugs. We know of experiments dealing with attenuation of effectiveness of UVB erythema production using tocopherol and ionol, which are known inhibitors of free-radical processes; it is known that they arrest oxidation of cutaneous lipids.

There are interesting data on reactions of labile peroxides of bovine serum albumin and glycyltryptophan with known radioprotective agents and other substances (Table 4) [7]. The table shows that radioprotective agents react efficiently with protein and peptide peroxides. It can be assumed that radioprotective agents may also have photoprotective action.

Table 4. Velocity constants of reactionslabile peroxides of bovine serum albumin (k_B and glycyltryptophan (k_{GT} with radioprotective agents and other substances.

Substance	k_B, $M^{-1} \times s^{-1}$	k_{GT}, $M^{-1} \times s^{-1}$	Substance	k_B, $M^{-1} \times s^{-1}$	k_{GT}, $M^{-1} \times s^{-1}$
Mercamine	4.6	10.6	Propyl gallate	1.2	0.4
APT	1.6	1.8	Serotonin	0.14	—
AET	1.7	3.3	Sodium sulfate	0.6	—
Cysteine	2.6	10.4	Mercamine disulfide	0.4	—
Reduced glutathione	1.3	3.5	Thiosulfate	0.6	—
Thiourea	2.9	4.4	Potassium iodide	—	0.6

* * *

Thus, this survey has shown that, with formation of ozone holes, there is dramatic increase in intensity of UV radiation in the range below 300 nm, the short-wave edge of the solar spectrum near the earth's surface shifts to the UVC range. We have described the results of studies of the main photobiological effects on man: erythema, tanning, photoallergies, photocarcinogenesis, and photolesions to the eyes, which rapidly increase in severity with decrease in ozone concentration in the atmosphere. We have discussed potentially hazardous photosensitizers among metabolites and drugs, the means and mechanisms of photoprotection. According

to reported findings, studies of photoprotection and photosensitization have not mitigated the menacing forecast of rise in UV radiation doses due to appearance of ozone holes, and further investigations are urgently needed.

Work on this article was carried out with the financial support of the Russian Fund for Basic Research (93-04-6662).

References

1. Okabe, H., "Photochemistry of Small Molecules", Moscow, Mir, 1981, 280 pages.

2. Flugge, S., ed., "Encyclopedia of Physics," Vol 52, Berlin, Springer Verlag, 1959, p 17.

3. Allen, C. W., "Astrophysical Quantities," Moscow, Mir, 1977, p 184.

4. Rabek, J. F., "Experimental Methods in Photochemistry and Photophysics," Moscow, Mir, 1985, 544 pages.

5. Moiseyev, A. A., "Tablitsy perevoda yedinits osnovnykh dozimetricheskikh i radiatsionnykh velichin. Spravochnik" [Guide: Conversion Tables for the Main Dosimetric and Radiation Units], Moscow, Energoatomizdat, 1986, 112 pages.

6. Vladimirov, Yu. A., and Potapenko, A. Ya., "Fiziko-khimicheskiye osnovy fotobiologicheskikh protsessov" [Physicochemical Bases of Photobiological Processes," Moscow, Vyssh. shk., 1989, 199 pages.

7. Sapezhinskiy, I. I., "Biopolimery: kinetika radiatsionnykh i fotokhimicheskikh prevrashcheniy" [Biopolymers: Kinetics of Radiation and Photochemical Transformations], Moscow, Nauka, 1988, 216 pages.

8. Lozovskaya, Ye. L., and Sapezhinskiy, I. I., BIOFIZIKA, 1933, Vol 38, No 1, pp 31-36.

Immunological Methods in Epidemiological Monitoring of the Public Exposed to Radioactive Iodine as a Result of the Chernobyl Accident

937C0332B Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 10 Oct 92) pp 479-483

[Article by A. M. Poverennyy, A. P. Shinkarkina, V. K. Podgorodnichenko, V. S. Parshin, and A. F. Tsyb, Medical Radiology Research Center, Russian Academy of Medical Sciences, Obninsk, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster" ; UDC 614.876:621.039.58]

[Abstract]Immunological (modifications of passive agglutination of particles and enzyme immunoassay, agglutination of gelatin particles loaded with microsomal antigen, and radioimmunoassay of thyroid microsomal and antimicrosomal antibodies) and ultrasound screening (of the thyroid) methods were compared in a study of 6398 inhabitants of Korosten, Zhitomir Oblast, at the time of the Chernobyl disaster. Ultrasound screening revealed changes in the thyroid in 108 cases; serum samples were taken from these and 22 subjects without changes for demonstration of antibodies to the microsomal fraction of the thyroid using immunological methods. There was a high degree of coincidence of diagnoses made by ultrasound and immunoassays, which indicates that the latter can be used for the said population to supplement the ultrasound findings. Figures 2, tables 1, references 7 Western.

Modification of Adrenergic Function of the Heart Under the Effect of Radioecological Conditions in the 10-Kilometer zone of the Chernobyl Accident

937C0332C Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 25 May 92) pp 484-488

[Article by L. M. Lobanok, A. Ye. Kiriyenkov, and N. V. Gerasimovich, Institute of Radiobiology, Belarus Academy of Sciences, Minsk, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC 574:538.1.04]

[Abstract]Experiments were carried out on rats kept in the 10-km zone of the Chernobyl disaster (floodplain of the Pripyat River) for one month, exposed at dose rates of 20 mR/h. Radionuclides were assayed in the perfused isolated heart right after the exposure period and 6 months later, and findings were compared to control rats that were not exposed to radioactivity. Records were kept of heart rate, systolic, diastolic pressure, rate of rise and drop of pressure, and volumetric blood flow rate. The membrane filtration method, with ^{3}H-alprenol hydrochloride and propranolol antagonists, was used to test β-adrenoreceptors, with determination of specificity, binding sites and hormone affinity of the receptor. The experimental group of rats showed changes in amount, structural and functional properties of β-adrenoreceptors of the myocardium. Rate of contraction of the isolated heart and volumetric coronary flow diminished 6 months after exposure. It can be assumed that restoration of β-receptor density after 6 months and their affinity for agonists is related to impaired interaction of β-adrenoreceptors and N protein. The functional state of the heart did not change with 30-day exposure to the contaminated zone, but there was alteration of mechanisms of its adrenergic regulation. Figures 1, tables 1, references: 10 Russian, 3 Western.

Statistical Criterion of Contamination Heterogeneity in Studies of Biotic Factors of Radionuclide Migration

937C0332D Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 18 May 92) pp 489-498

[Article by A. P. Kravets, D. M. Grodzinskiy, Yu. A. Pavlenko, N. N. Zhdanova, A. I. Vasilevskaya, and O. I. Sinyavskaya, Institute of Cell Biology and Genetic Engineering, Ukrainian Academy of Sciences, Kiev, and Institute of Microbiology and Virology, Ukrainian Academy of Sciences, Kiev, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC 574.41.5:539.163]

[Abstract]This study was motivated by the chief distinction of Chernobyl-related contamination from the standpoint of soil-plant migration of radionuclides, i.e., its spatial and aggregate heterogeneity. An independent statistical index of contamination heterogeneity was offered: the Bravais-Pearson coefficient of linear correlation between soil and dry plant biomass radioactivity for demonstration of "hot" particles as an indication of relative extent of contamination. Accumulation of β emitter radionuclides was studied in the above-ground portions of rye, oats, barley, wheat and peas raised in 1.5-liter containers with sod-podzolic soil taken in the 10-km zone of the Chernobyl disaster, as well as effects of soil micromycetes (Cladosporium cladosporioides and Penicillium rosco-purpurent) cultivated in Czapek's liquid mineral medium on dissolution of hot particles. Cesium-137 and Cerium-144 radionuclides were absorbed at variable rates by the plants, depending on stage of growth. The rates were higher when in subsequent planted specimens, mainly in rye and oats, affected by their precursors. Experimental data on radionuclide migration were obtained with the use of this index, and its usefulness was validated. Figures 2, tables 2, references: 8 Russian, 2 Western.

Change in Animal Radiosensitivity After Exposure to Zone of Chernobyl Disaster

937C0332E Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 7 Apr 93) pp 499-507

[Article by A. A. Konradov, N. V. Lyubimova, and I. I. Pelevina, Institute of Chemical Physics imeni N. N. Semenov, Russian Academy of Sciences, Moscow, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC [577.2+576]:539.1.04]

[Abstract]Changes in radiosensitivity were studied in experiments onvarious lines of mice: $(CBAxC57BL6)F_1$, $(DBAxC57Bl)F_1$ and DBA2, kept in metal cages (wire mesh, sheltered from rain and direct UV light) in the village of Yanovo, on the border of the "brown forest" in the zone of the Chernobyl disaster. Feed and water were brought in from Chernobyl, with a control group of intact mice in clean zones. Exposure time ranged from 1 to 14 days, and dose rate was 100 mR/h, after which experimental and control animals were taken to Moscow and exposed to acute radiation in doses of 3.0, 5.0, 7.0 and 9.0 Gy, at a dose rate of 2.32 Gy/min,after 2, 7 and 30 days. Effects were evaluated using the χ^2statistical criterion of reliability. Figures illustrate comparative survival rates of control and experimental animals as a function of time after acute irradiation. Radiosensitivity to subsequent acute exposure was modified in animals exposed to radiation in the disaster zone, the direction and intensity of this effect were a function of interval between exposure in this zone and acute irradiation. It is suggested that there are additional factors in the disaster zone that are involved in altering animal sensitivity to subsequent exposure to radiation. Figures 10, tables 1.

Exposure of Cells in Tissue Culture and in Animals (Mice) in 10-Kilometer zone of the Chernobyl Accident

937C0332F Moscow RADIATSIONNAYA BIOLOGIYA. RADIOEKOLOGIYA in Russian Vol 33 No 1, Jul-Aug 93 (manuscript received 2 Apr 93) pp 508-520

[Article by I. I. Pelevina, G. G. Afanasyev, V. Ya. Gotlib, A. A. Alferovich, M. M. Antoshchina, N. I. Ryabchenko, A. S. Sayenko, I. A. Ryabtsev, and I. N. Ryabov, Institute of Chemical Physics imeni N. N. Semenov, RAN [Russian Academy of Sciences], Moscow, Medical Radiological Research Center, Russian Academy of Medical Sciences, Obninsk, and Institute of Evolutionary Animal Morphology and Ecology imeni A. N. Severtsov, RAN, Moscow, under the rubric "Investigation of the Sequelae of the Chernobyl Disaster"; UDC [577.2+576]:539.1.04]

[Abstract]Studies were carried out in order to demonstrate a set of disturbances on the cellular, molecular, biochemical and whole organism levels after exposure to the disaster zone, as well as enhanced sensitivity to subsequent acute irradiation. Experiments were carried out on $(CBAxC57Bl)F_1$ mice in cages with wire mesh on all four sides and HeLa cell (carcinoma of the human cervix) cultures in plastic vials placed (in a roofed area) directly on contaminated soil for 1-12 days, as well as control animals and cultures kept in a clean area, with the same climate, beyond the 30-km zone of the disaster

area. Cytogenetic studies were carried out to determine HeLa survival rate, number of micronuclear and giant HeLa cells, which revealed that there was enhanced sensitivity of the cells to subsequent acute irradiation, demonstrable for 12-15 generations or more after exposure in the disaster zone, and it is a function of doses of chronic and acute radiation. Genetic studies were made of bone marrow somatic cells of experimental animals and revealed the most appreciable changes in number of aberrations per cell, and in chromosome type of aberrations, as well as lesions to bone marrow stem cells, disintegration of thymus chromatin indicative of interphase death, and decrease in peripheral blood leukocytes. Figures 1, tables 8, references: 15 Russian, 6 Western.

Health and Psychosocial Problems of Chernobyl Victims in Israel. Jerusalem Conference, 4 June 1992

937C0338 Moscow MEDITSINSKAYA RADIOLOGIYA in Russian Vol 38, No 6, 1993 pp 44-45

[Article by F. M. Lyass, R. M. Ivang, under the rubric "Current Events"]

[Text] At the initiative of the Jewish University, the regular conference on certain health-care problems affecting a contingent of individuals directly associated with the accident at the Chernobyl Nuclear Power Plant was held. The problem affects a considerable portion of the population of Israel because more than 150,000 people from radioactively contaminated regions have come to Israel since 1987, with 100,000 of them coming from Ukraine and 40,000 coming from Belarus (of which 11,000 are from Gomel, 5,000 from Mogilev, and 14,000 from Minsk); that constitutes 2 percent of the total population of the country. Naturally, Israel's health care sector could not turn its back on the problem. Science and social organizations of the country have also gotten involved. In connection with that, the main science centers of Israel (Jerusalem, Beersheba, Haifa, and Tel Aviv) have begun research involving a study of the health of repatriates who became exposed to the radiation and nonradiation "Chernobyl factors." Attempts are being made to perform medical examinations of repatriates from those areas in order to identify any link between morbidity and radiation and social factors. Particular attention has been devoted to children. Volunteer social organizations are helping in that: SOS-Chernobyl, Gomel-Chernobyl, and Soyuz-Chernobyl. A year ago, the epidemiologists of Israel held a successful seminar devoted to the problem of the health of new repatriates from areas exposed to "Chernobyl factors."

The Jerusalem conference drew a large audience—more than 100 people. In attendance were local residents, plus physicists, medical professionals, and hygienists who had repatriated from various areas and cities of the CIS and who were involved in radiation medicine.

The chairmen of the meetings were as follows: Z. Volfson (Lee Wolfson) from Jewish University, and Ye. Rikhter (Eliyahu Richter), D. Rabinovich (Dan Rabinovitz), and D. Goldsmit (John Goldsmit) from Ben Gurion University.

The conference was opened with a survey paper by R. Tsvang (Roma Tsvang), "Situation with Olim from the Region of the Chernobyl Accident" (In Israel, Olim is the name for repatriates who come into the country, from the modern Hebrew root *podnyal*). The presenter characterized in detail the radiological situation in the rayon in which the Chernobyl accident occurred and in the oblasts surrounding that rayon. He noted the importance of that information because a population that is primarily Jewish has come from those rayons into Israel and continues to come in. He reported that, according to the most recent data, those rayons of the CIS have demonstrated a dramatic increase in the number of cancer cases since 1986 (by 16 percent in Ukraine, for example); thyroid diseases have increased 400-fold; Belarus has recorded a 10-fold increase in individuals with diseases of the blood or the hemopoietic organs and an 18 percent increase in genetics-related diseases (in Mogilev Oblast, the increase in genetics-related diseases is more than 20 percent). The number of individuals with neuropsychiatric disorders has increased considerably. (Hereinafter we present the author's text, although the information given does not always correspond to actual data.) All of that has alerted the medical community of Israel and is obliging a differential approach to the examination and treatment of individuals from those areas. However, doctors working in hospitals and in polyclinics are not familiar with the problems that come up with those who have come from the "Chernobyl area," which leads to a number of misunderstandings and to refusals to provide medical assistance. The presenter emphasized the need to screen those who have come into the country from the CIS, particularly children, in the last two years with uniform methods approved in a procedural center.

The data of the first paper was supplemented by the paper of Z. Veshler (Zeev Weshler), who, in his paper "Long-term Assessment of Endocrine Shifts," reported preliminary data and subsequent research "on the principal radiation parameters in ecological systems that appeared right after the accident in 1986, as well as present systems." The presented also submitted the results of an examination of a limited contingent of children who came from contaminated areas by a specially assembled medical team in the hospital at Adassa-Eyye Kerem. He noted that thyroid problems were identified in 38 percent of those examined and that conjunctivitis was established in 40 percent. The author of the paper devoted especial attention to neuropsychiatric shifts in children in rehabilitation camps. Their being separated from their parents and the constant reminder that they are from Chernobyl leads to mental disturbances, irritability, sleep disturbances, and other

asthenovegetative symptoms. Weshler feels it necessary that all those who come in be separated into risk groups for detailed medical examination and ongoing observation. That represents roughly 5-10 percent of all those who come from regions with an elevated radiation background.

A great deal of interest was aroused by M. Kastel's (Michael Quastel) paper, "Assessment of ^{137}Cs Content and Levels of Internal Irradiation in 'Chernobyl Victims,'" which reported the results of a whole-body-counter examination of 1,300 individuals who came to Israel from Kiev and Gomel (on average, 100 days before the examination). The ^{137}Cs content in the body averaged 0.8 kBq. That is roughly the same amount that was determined (from the literature data) 21 years ago, when America and the CIS [sic] were conducting systems explosions of nuclear devices. Such an amount of ^{137}Cs incorporated in the human body will create 21 μSv/year, which is one-tenth the background-radiation dose rate.

G. Rennert (Gad Rennert), in his paper, "Method of Passive Observation of Effects of Chernobyl Factors in Olim," noted that at present, from an epidemiological standpoint, the main indices reliably reflecting the state of health of the populace are mortality and morbidity rates. That information, with a well-run epidemiological service like Israel's (data of the Ministry of Health and the Ministry of Adsorption [sic]), can be obtained regularly, without any special nontargeted examinations of the Chernobyl victims. In Israel, programs exist and are being implemented to identify morbidity, including oncological, which is why special programs for Chernobyl "victims" need not be created. Computer analysis of the existing information and comparison against representative control groups of the population will enable assessment of the possibility of Chernobyl factors affecting repatriates from the CIS. Those conclusions were drawn on the basis of a computer analysis of a databank of 100,000 individuals from Ukraine, 42,000 from Belarus, and 100,000 from Russia.

I. Iskovich (Yosef Iskovich), in his paper, "Passive Monitoring of Cancers in Various Groups of the Population," reported on a databank for the epidemiological study of oncological diseases in Israel. Every three months, oncological morbidity in the country is analyzed on the basis of age, social and ethnographic indices, and length of residence in Israel. Separately analyzed are groups of olim from Ukraine, Belarus, and other regions of the former USSR; morbidity among those who have come to Israel from other countries is also analyzed. According to the data of the analysis of information obtained from the databank, olim who have come from the former USSR in the last two years show an elevated risk for oncological disease; but such a tendency may be due not only to radiation, but also to other harmful factors, which are more than abundant in Eastern Europe and Asia. On the basis of the data obtained, it is impossible to establish a clear link between the elevated cancer morbidity and the exposure to ionizing radiation in small doses.

The presented made especial note of the significance of "passive monitoring" among people who have come from regions affected by Chernobyl.

A special session was devoted to the psychosocial effects of the Chernobyl accident. A paper by Binyamin Moar and Kira Levin, "Method of Interviewing in Examining Patients in the Soroka Clinic," noted that groups of olim who had been in Israel for seven months demonstrated symptoms like alarm, depression, sleep loss, and a feeling of guilt. However, depressive syndrome as a psychiatric disease was not noted in any of those examined. Greater frequency and expression of those symptoms were noted among men who had not found work by the examination date and had a family dependent on them, as well as among individuals in whom those psychopathological symptoms had been identified before they came to Israel. Assessment of the gravity of psychopathological symptoms by physician-internists was more serious than by psychiatrists.

Ye. Mendelson (Ezra Mendelson), in his paper, "Experience With Psychotherapy With Chernobyl Victims," indicated the possibility of using relaxation and hypnosis to remove feelings of alarm, demoralization, uncertainty, and tension in a number of individuals. He is expanding his attempts to set up that type of medical assistance for olim from the Chernobyl areas. Mr. Abramovich-Polyakov, in a brief paper titled "Psychiatric Examination of Cleanup Crews from Chernobyl," discussed his experience in the neurological division of the Institute of Occupational Disease in Kharkov. All 60 of the hospitalized patients showed asthenovegetative symptoms: nervousness, temper flareups, fear, underweight, high levels of perspiration, intermittent pulse and pains in the region of the heart, and emotional lability. The author ties the appearance of those symptoms to radiation exposure (although he doesn't cite absorbed doses), noting the good health enjoyed among his patients before they worked at Chernobyl as tunnelers beneath the reactor during the first stage of the cleanup of the accident.

Yu. Svikel (Julie Cwikel), in a paper titled "Social Tension Among Accident Victims," assessed the effect of various types of accidents on the stress state of the populace. She noted that stress among victims is considerably greater if the authorities hide the truth from the populace and if there are children among the victims, which was the case with the Chernobyl accident. Stress among the olim is observed more often and is more pronounced because they of their concerns about emigration, the difficulties in getting settled in Israel, unemployment, and loss of family economic stability.

Also speaking at the conference were representatives of social organizations involved with the social protection of those arriving from disaster areas: V. Shnaydman

from the SOS-Chernobyl organization, and a Mr. Raykhman from the organization Gomel- Chernobyl. They noted the seriousness of the social problems that have come about in individuals who have come to Israel from regions with elevated radiation background levels, the inadequacy of the medical service, and the lack of attention paid by officials from the Ministry of Health and other state organizations.

In their closing remarks, John Goldsmit and D. Rabinovitz gave high marks to the papers presented at the conference, and they noted the need for the work to continue and to develop. They were of the opinion that a more accurate assessment of the previous and present levels of radiation exposure is needed. They also emphasized the desirability of organizing a system of medical supervision of that contingent of the population of the state of Israel, with the enlistment of physicians and individuals of other specialties who have come to Israel as repatriates from the former USSR. Close contact is needed with social organizations and with research and practical-medicine institutions. All that must rely on a well- developed system of supervision of olim who have come from the former USSR within the last 2-3 years.

Foreign Broadcast Information Service (FBIS) and Joint Publications Research Service (JPRS) publications contain political, military, economic, environmental, and sociological news, commentary, and other information, as well as scientific and technical data and reports. All information has been obtained from foreign radio and television broadcasts, news agency transmissions, newspapers, books, and periodicals. Items generally are processed from the first or best available sources. It should not be inferred that they have been disseminated only in the medium, in the language, or to the area indicated. Items from foreign language sources are translated; those from English-language sources are transcribed. Except for excluding certain diacritics, FBIS renders personal names and place-names in accordance with the romanization systems approved for U.S. Government publications by the U.S. Board of Geographic Names.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by FBIS/JPRS. Processing indicators such as [Text] or [Excerpts] in the first line of each item indicate how the information was processed from the original. Unfamiliar names rendered phonetically are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear from the original source but have been supplied as appropriate to the context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by the source. Passages in boldface or italics are as published.

SUBSCRIPTION/PROCUREMENT INFORMATION

The FBIS DAILY REPORT contains current news and information and is published Monday through Friday in eight volumes: China, East Europe, Central Eurasia, East Asia, Near East & South Asia, Sub-Saharan Africa, Latin America, and West Europe. Supplements to the DAILY REPORTs may also be available periodically and will be distributed to regular DAILY REPORT subscribers. JPRS publications, which include approximately 50 regional, worldwide, and topical reports, generally contain less time-sensitive information and are published periodically.

Current DAILY REPORTs and JPRS publications are listed in *Government Reports Announcements* issued semimonthly by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161 and the *Monthly Catalog of U.S. Government Publications* issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The public may subscribe to either hardcover or microfiche versions of the DAILY REPORTs and JPRS publications through NTIS at the above address or by calling (703) 487-4630. Subscription rates will be provided by NTIS upon request. Subscriptions are available outside the United States from NTIS or appointed foreign dealers. New subscribers should expect a 30-day delay in receipt of the first issue.

U.S. Government offices may obtain subscriptions to the DAILY REPORTs or JPRS publications (hardcover or microfiche) at no charge through their sponsoring organizations. For additional information or assistance, call FBIS, (202) 338-6735,or write to P.O. Box 2604, Washington, D.C. 20013. Department of Defense consumers are required to submit requests through appropriate command validation channels to DIA, RTS-2C, Washington, D.C. 20301. (Telephone: (202) 373-3771, Autovon: 243-3771.)

Back issues or single copies of the DAILY REPORTs and JPRS publications are not available. Both the DAILY REPORTs and the JPRS publications are on file for public reference at the Library of Congress and at many Federal Depository Libraries. Reference copies may also be seen at many public and university libraries throughout the United States.

END OF

FICHE

DATE FILMED

24 JAN 94